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Bulletin No. 22 (Seventh Revision) *October, 1948*

Swine Production in Alberta

BY

DEPARTMENT OF ANIMAL SCIENCE

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UNIVERSITY OF ALBERTA
FACULTY OF AGRICULTURE

Swine Production in Alberta

BY

DEPARTMENT OF ANIMAL SCIENCE

Distributed by
Department of Extension, University of Alberta
Edmonton, Alberta, Canada

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BEAR IN MIND

1. **Pigs will produce more meat from 100 pounds of feed than any other farm animal.**

2. **The pig will eat and grow and finish on a greater variety of feed than any other animal on the farm.**

3. **Pigs multiply rapidly so that the money invested in a sow is returned quickly.**

4. **Pigs constitute a reliable source of revenue and provide the farm table with a high class meat product.**

5. **Approximately 13,000,000 hogs were marketed in Alberta during the six years 1941 to 1946. This Province is an important contributor to Canada's export bacon supply.**

6. **Success in pig raising depends upon the use of good breeding stock of the proper type, together with good feeding and management methods.**

7. **One of the main problems in swine raising in Alberta arises out of the scarcity of skim-milk. A proper substitute should be used when milk is lacking.**

8. **Alberta grown grain—oats, barley and wheat—when properly supplemented will produce as good bacon hogs as can be produced anywhere in the world.**

9. **Pigs should be kept year in and year out. Over a period of years they will provide a profitable outlet for farm grown grains and farm by-products.**

10. **Control of diseases and parasites is essential to success in pig raising. Diseased pigs or those infested with worms are a liability rather than an asset.**

PREFACE

Since the swine herd was established at the University of Alberta in 1917, some 13,500 pigs have been farrowed. These pigs have been utilized in a variety of ways. A certain percentage have been shipped throughout the Province to assist in improving the quality of commercial pigs; a considerable number have served as material for student judging classes, but the majority have been used in the carrying out of experimental work.

During the past 30 years more than 130 swine feeding experiments have been conducted. Information has been gathered on a fairly wide variety of swine feeding problems. The object in conducting these experiments has been to gather information which would be of value to the swine raisers of Alberta and to assist in establishing principles which would have an application in swine-raising in any country.

The material which is presented in this bulletin, which now goes into the seventh edition, is based in the main on the results of our own experiments. Sections dealing with swine raising equipment and swine diseases have also been included. It is hoped that the bulletin will prove helpful to swine raisers and that it will assist in the direction of better and more profitable hog production in Alberta.

Swine Production in Alberta

BY

R. D. SINCLAIR and L. W. McELROY

Department of Animal Science

Since the earliest homesteading days pig raising has constituted a worth-while phase of Alberta's agriculture. Those whose occupation of Alberta's lands preceded the development of established markets found the pig a good source of food supply and a means of converting unmarketable grains into a commodity that had a cash value. We find the pig playing much the same role after approximately sixty years of agricultural evolution in this Province, only in the interval annual revenue from pig sales has risen from a few thousand dollars to many millions and pork products processed in Alberta packing plants find their way to the markets of the world. It may be recorded that during 1944, when Alberta marketed approximately 3,000,000 head of hogs she attained the distinction of being the unit in the British Empire which contributed the largest volume of bacon to the people of Great Britain in a time of great need. Alberta requires approximately 350,000 hogs for her own use. In 1944, 2,650,000 head were available for export. If it is assumed that this surplus was exported in the form of Wiltshire sides, sufficient bacon was made available to supply 24,000,000 people for a period of one year with a British war-time ration of four ounces per week.

In addition to supplying a high-class meat product the pig is second-to-none as a converter of high grade as well as low grade grains into a concentrated, relatively low freight rate commodity. In times of high grain prices the value of the pig in the farm economy is not usually appreciated, but when prices decline, when quotas limit the amount of grain which can be marketed, or when grades are lowered as a result of frost or other damage the value of this class of livestock is brought markedly to the fore. As will be indicated in the discussion which follows, the Alberta farmer who has kept pigs year in and year out, either as a very minor side line or as a major part of his farm enterprise, has little reason to be discouraged with the results in terms of financial returns.

During the six years, from 1941 to 1946 inclusive, approximately 13,000,000 hogs were delivered to stock yards and packing plants in Alberta, and the value of these hogs amounted to approximately $306,000,000. According to figures supplied by the Dominion Markets Service, the value of all hogs sold in Alberta in the year 1944

alone was in excess of $75,000,000. The average annual revenue from hogs sold at stock yards and packing plants during these six years was approximately $51,000,000, a sum which is significant in connection with farm buying power.

It is of interest to note Alberta's position in relation to the other provinces in Canada in the matter of swine population. According to the most recent statistics available, the various provinces rank as follows from the standpoint of swine population:

TABLE I.—ESTIMATED NUMBER AND VALUE OF SWINE IN CANADA, 1946

Province	Number	Value $
Ontario	2,013,000	51,130,200
Alberta	1,104,000	21,638,400
Quebec	868,000	20,832,000
Saskatchewan	757,000	14,383,000
Manitoba	377,000	7,577,700
New Brunswick	78,000	1,801,800
British Columbia	67,000	1,346,700
Prince Edward Island	64,000	1,632,000
Nova Scotia	49,000	1,259,300

It will be observed that in 1946 Alberta stood second among the provinces in Canada in the matter of swine population and it may be suggested that her position is likely to be strengthened in the years that lie ahead. Conditions are favorable for swine raising in the Province from the standpoint of volume, quality and continuity of feed supply, and this type of agricultural production is becoming firmly established, particularly in the mixed farming area. It is important that swine raisers realize Alberta's status in this field because it is clear that they have an important responsibility as contributors to Canadian pork supply for home or export consumption. The volume of live hogs originating in this Province must materially affect the quality of Canadian pork products and it, therefore, behooves Alberta producers to pay careful attention to improvement in quality.

Some idea of the trend of the swine industry in Canada and in Alberta over a period of years may be gathered from a review of the total number of swine marketed at stock yards and packing plants from 1923 to 1946. In order that improvement in quality may be studied in relation to increase in volume, the percentage of "selects" or "A" grade carcasses is submitted, along with volume of marketings, in Table II, which follows:

TABLE II.—TOTAL SWINE MARKETED IN CANADA AND IN ALBERTA AND PERCENTAGE IN TOP GRADE

(Selects, 1923-1940; "A" Grade, 1941-1946)

	Marketings		Percent "Selects"	
	Canada	Alberta	Canada	Alberta
1923	2,362,146	406,380	15.28	2.43
1924	3,081,382	624,058	14.60	2.83
1925	2,785,241	620,036	15.42	3.55
1926	2,653,420	604,127	15.73	5.38
1927	2,815,093	544,321	17.06	6.09
1928	2,758,439	586,070	17.15	6.56
1929	2,659,009	681,544	16.52	5.54
1930	2,301,349	628,935	15.52	6.05
1931	2,643,372	723,352	15.14	7.13
1932	3,198,183	1,008,452	15.11	8.43
1933	3,205,425	1,032,169	16.28	7.94
1934	3,028,738	1,012,827	19.10	12.23
1935	2,957,621	953,752	22.96	18.56
1936	3,796,952	1,039,466	24.44	22.62
1937	3,986,397	980,272	24.44	24.93
1938	3,245,535	782,838	29.58	32.51
1939	3,706,179	979,898	29.88	36.00
1940	5,449,626	1,485,372	27.93	32.84
1941	6,216,207	1,947,053	31.53	30.47
1942	6,228,163	2,182,342	29.92	25.81
1943	7,149,421	2,392,384	27.94	23.88
1944	8,863,178	2,981,940	28.27	24.30
1945	5,861,073	1,946,114	32.12	27.22
1946	4,460,736	1,250,602	32.44	23.58

A glance at Table II will show that, although there have been wide fluctuations from time to time, there has been a trend towards an increase in the volume of swine marketings in Alberta during the past quarter century. The peak reached in 1944 was due, of course, to the demand for bacon to fill contracts with Great Britain and to a comparatively favorable relationship between hog and grain prices. The decline in marketings since 1944 indicates that swine production in Canada and in Alberta has not been stabilized. Removal of grain marketing restrictions, combined with high grain prices, and a shortage of labor and equipment for swine husbandry have contributed to the marked decrease in Alberta swine production since 1944. This occurrence is in line with a general weakness in our swine production programme—a tendency to go into and out of the pig business on the basis of a short term view rather than to develop a condition of stability based upon the probable outcome of this particular phase of the farm enterprise over a term of years.

Is Hog Raising in Alberta Profitable?

It will be appropriate, early in the discussion of swine production problems in Alberta, to consider whether or not the pig business in this Province is on a sound economic footing. Our interest in what will follow, and in fact our interest in pig raising generally, in terms of a long time programme, may hinge on that point. A review of what has taken place in the years which have passed will prove valuable in this connection and may point the way to what may be expected to happen in the years that lie ahead.

In considering the economic status of the hog business, it seems necessary to attempt to relate the cost of production to the selling price over a period of years and thereby show the number of years when hogs have been good property and the number of years when they could be considered a liability.

We have chosen to consider the years 1918 to 1947 inclusive. This span of thirty years includes periods of world war, post war recovery, prosperity and depression. It would thus appear to cover a sufficient variety of conditions to yield a result which should prove a valuable guide in laying plans in connection with a swine raising enterprise.

Two main factors enter into the cost of producing hogs. In the first place, overhead cost must be considered and in the second place the feed cost is an important item. At the University of Alberta, in an attempt to arrive at the cost of production of 100 pounds live weight of hogs, we have estimated in as practical a manner as possible the overhead cost of producing pork. We have taken four sows as an average farm unit and have calculated on the basis of seven pigs raised per litter with all sows farrowing in the spring and two farrowing again in the fall, or, in other words, six litters of seven pigs or forty-two pigs marketed during the year. Charging interest at six per cent on the money invested in breeding stock, buildings and equipment, and on the value of the land used for pasture, allowing for a ten per cent depreciation on buildings and equipment, charging pasture on the basis of cost of seeding and providing for a $3.00 labor return per pig, as well as fair compensation for delivery of pigs to market, we estimated an overhead cost of hog production. This figure has varied from time to time depending upon depreciation in values of breeding stock and other items as well as the labor return. The range has been from a high of $3.25 per 100 pounds during what may be regarded as normal years to a low of $2.15 per 100 pounds during the period of the depression.

From the results of numerous experiments with pigs under various conditions, we conclude that a figure of 450 pounds of grain or its equivalent for 100 pounds gain in weight is one that will meet average conditions. While it is true that there are many farms, especially those where cows are being milked, where the feed required will be considerably below 450 lbs., it must be remembered that there are many farms where on account of lack of proper supplements, the figure will run much higher, and on the whole the 450 pound figure will not be far wide of the mark. If the monthly average cash grain price of oats and barley, feeding half and half, is charged to the 450 pound figure, and the overhead figure

is added to this, we arrive at the monthly average cost of producing hogs. When this figure is related to the average monthly price of the basic grade of hogs, we can study the cost of production in relation to selling price.

The chart which is shown in Fig. 1 sets out the average monthly cost of production from January, 1918, to December, 1947, together with the average monthly selling price of hogs on the Edmonton market. In connection with production costs, grain was charged at Edmonton cash grain prices for 3 C.W. oats and 3 C.W. or No. 1 feed barley. Hog prices are based on the "thick smooth" grade for the years 1922 to 1929, on the "bacon" grade from 1930 to 1940, and on carcass prices converted to live hog prices from 1941 to 1947. Premiums for "selects" or "grade A" carcasses have not been included.

A study of the chart will show:

(1) The average price of the basic grade of hogs on the Edmonton Stockyards over the thirty year period from 1918 to 1947 was $10.61 per 100 lbs. live weight.

(2) The average monthly cost of production of 100 lbs. live weight of hogs over the same period was $8.09.

(3) During this thirty year period pigs paid all overhead costs, including interest on breeding stock, buildings and equipment, took care of depreciation, paid a labor return and marketing charges, and provided for a margin of approximately $2.52 per 100 lbs. between cost of production and selling price.

(4) The average monthly Edmonton cash grain price of 3 C.W. barley was 53c per bushel, whereas this grain was marketed through hogs at 82c per bushel. The barley was increased in value 55 per cent and the oats in similar proportion by marketing as pork instead of as grain.

(5) During this thirty year period there have been only two years, 1924 and 1932, in which the average cost of production for the year has exceeded the selling price. This condition existed for all 12 months of 1924 and for 9 months in 1932. In the remaining 28 years of this period there have been a total of only 18 months, scattered at intervals, in which the cost of production has exceeded the average selling price.

(6) During the period from 1918 to 1934 "ups" and "downs" in hog prices followed one another in a fairly definite order. Following the introduction of the "quota" plan on the British Market in 1934 this trend was not so marked between 1934 and 1939. The operation of the Canada-United Kingdom bacon agreement, together with fixed prices for grain following 1939, introduced a period of com-

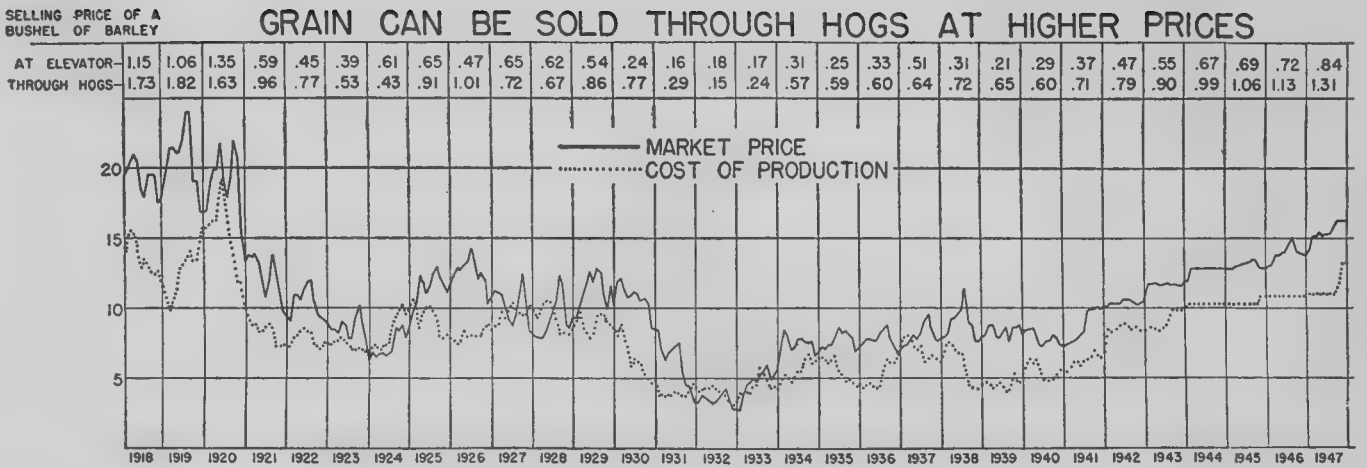


Fig. 1.—Chart showing relation between cost of production and selling price of hogs—Edmonton 1918-1947. The solid line (upper) indicates "market price" and the dotted line (lower) represents "cost of production." The two lines of figures at the top of the chart show: upper—average yearly market price of barley at Edmonton; lower—average value of barley per bushel when marketed through hogs.

paratively stable hog prices with a fairly constant relationship between the cost of production and selling price.

On the basis of the findings of the study just outlined, it would appear that one may safely state that the swine business in Alberta has been on a sound economic footing. No business can be judged on one year's operations, and there are few enterprises that do not show occasional "loss" years. The Alberta farmer who makes pig raising a part of his regular farming programme over a period of years will find the business profitable rather than unprofitable. The individual who attempts to run pigs on the "in and out" plan is very apt to find the results disappointing as he is likely to be in when he should be out and out when he should be in. The "in and out" policy disturbs the marketing situation and gives rise to a condition of instability that is detrimental to the man who is a regular producer. The man who keeps pigs regularly, slightly raising or lowering the number of brood sows as changes in the market may be foreseen, is the one who contributes to permanency in the pig business, and is the one who has a class of stock on hand which can satisfactorily utilize grain of good quality or grain which may have depreciated in quality as a result of some adverse condition. In the latter regard our experiments of recent years have indicated that feed wheat can be satisfactorily utilized by pigs, and in 1929 with hogs selling around the ten-cent mark, feed wheat was marketed through the "hog route" at as high as $1.96 per bushel. In connection with the study just reviewed, it would be safe to state that the man who had dairy by-products available on the farm and has received a premium for the highest grade of market hog has had few "loss" experiences.

As a general rule the attitude toward pig raising is based upon the price at which grain can be marketed through hogs. The prices received for barley marketed through hogs as set out at the top of the chart shown in Fig. 1, represent the net return after deducting from the selling price of hogs the overhead cost of producing 100 pounds of live hog. The net return is a more representative figure than the gross price which is sometimes quoted. If hogs are selling at the equivalent of $10.00 per cwt. live weight and the overhead cost per cwt. is $3.25, the return on the grain required to produce 100 pounds of live hog is $6.75. If the requirement for grain or its equivalent is 450 pounds, the return per pound of grain is 1½c. The net price received for wheat is 90 cents per bushel, barley 72 cents per bushel, and oats 51 cents per bushel.

When the feed requirement is lowered as a result of efficient feeding, the net price is increased, and on the other hand, when the amount of feed required is high, a lower price is returned.

As a guide to the net returns which may be expected for grains when hogs sell at variable prices, and in order to indicate the influence on returns of the amount of feed required to produce 100 pounds of live weight gain, Table III is submitted. An overhead charge of $3.25 per 100 lbs. of live hog was used in calculating the net returns shown in this table.

TABLE III.—NET RETURNS FOR GRAIN WHEN MARKETED THROUGH HOGS

Net returns for grain allowing 400 lbs. of grain or its equivalent for 100 lbs. live weight gain:				
Market price of hogs—live weight	$ 12.00	$ 16.00	$ 20.00	$ 24.00
Market price of hogs—dressed weight	16.00	21.35	26.65	32.00
Net value per bushel grain fed:				
Wheat	1.31	1.91	2.51	3.11
Oats	.74	1.08	1.42	1.76
Barley	1.05	1.53	2.01	2.49
Net returns for grain allowing 450 lbs. of grain or its equivalent for 100 lbs. live weight gain:				
Net value per bushel grain fed:				
Wheat	1.17	1.70	2.23	2.77
Oats	.66	.96	1.26	1.57
Barley	.93	1.36	1.79	2.21
Net returns for grain allowing 500 lbs. of grain or its equivalent for 100 lbs. live weight gain:				
Net value per bushel grain fed:				
Wheat	1.05	1.53	2.01	2.49
Oats	.59	.87	1.14	1.41
Barley	.84	1.22	1.61	1.99

Monthly Variations in Marketing

A situation which affects the business of processing hogs and presents a problem in connection with continuity of supply of pork products for export is the irregularity of volume of hogs being marketed from month to month. As a general rule, a much larger number of hogs is marketed during the fall and early winter months than during the summer months. Regularity of supplies is very desirable, and anything that can be done in connection with arranging for farrowing fairly steadily throughout the year will contribute to an even flow of hogs to the packing plants. There has been considerable improvement in Alberta in this respect during recent years. Better farrowing quarters, treatment for anemia and inside feeding have all contributed to this betterment in our performance. One of the important factors in establishing Denmark so solidly in the British bacon market during the inter-war years was regular volume of shipments resulting from an even week by week movement of hogs from Danish farms to bacon factories. We must continue in our efforts to still further improve our position in this respect. The only practical way to compensate for monthly fluctuations in slaughterings is to put bacon in cold storage and this will lead to a lowering of the net returns.

Our Market Outlet

A matter of great concern in connection with the production of any class of livestock is that of available markets for the product.

The Canadian market is, of course, our best outlet for pork and pork products, absorbing annually some 550,000,000 pounds or approximately 50 pounds per person. The Canadian population is, however, not large enough to absorb the annual pig crop of the country, and as a result we are in the position of being an exporting country. Since the quality of the pork which must be disposed of outside the country has an important bearing on the price paid for hogs in Canada, we are in the position of having to plan our pig raising programme along lines which will insure the marketing of a product of the very best quality.

While we, in Canada, are situated in close proximity to a great consuming nation, the United States, they, too, under normal conditions produce more pork than they require and may be regarded as an exporting rather than an importing country. A duty is placed upon live hogs and pork entering the United States from Canada. This means that we must look to some country which is a regular importer of pork products on a generous scale if we are to establish a steady market for Canadian hogs.

In this connection Great Britain stands as our most attractive market. Year in and year out Great Britain imports vast quantities of meat to meet the needs of her population. In normal times Britain imports pork products from many different countries, the total annual import requirement of bacon being around 700,000,000 pounds. With exports from European countries cut off as a result of the 1939-45 war, Great Britain was dependent upon Canada for practically her total supply of bacon and other pork products. As a result of this condition new opportunities and greater responsibilities were presented to Canadian swine raisers. British consumers in larger numbers than ever before were provided with an opportunity to become acquainted with Canadian bacon. A strong case for the continuation of a substantial bacon quota on the British market has been established. It is essential that the volume of production be maintained at a level which will enable us to take care of our present commitments with the United Kingdom and take advantage of whatever percentage of British bacon imports may be allotted to us under future trading arrangements.

The Canadian-United Kingdom Bacon Agreement

Since 1939 all negotiations regarding the export of Canadian bacon to Great Britain have been carried out between the British Ministry of Food and the Canadian Government. The first agree-

ment to supply Great Britain with a definite volume of bacon at an agreed price came into effect in November, 1939. Contracts were renewed annually during the period of the war with modifications in volume and price from year to year. It was stipulated that bacon delivered by Canada under the agreements must be of quality equal to the pre-war standard and that 75 per cent must be in the form of Wiltshire sides.

The following table will give some particulars regarding the various agreements covering the years from 1940 to 1948:

TABLE IV.—TERMS OF CANADA—UNITED KINGDOM BACON AGREEMENTS

Year	Quantity Bacon Specified (Million lbs.)	Quantity Bacon Exported (Million lbs.)	Average Price of Grade A Wiltshires at Seaboard ($ per 100 lbs.)
1940	291.0	331.0	18.01
1941	425.6	425.6	15.82
1942	600.0	600.0	19.77
1943	675.0	675.0	21.75
1944-45	900.0	1108.5	22.50
1946	450.0	272.9	24.39
1947	350.0	.....	27.50
1948	195.0	.....	36.00

The Canadian Meat Board

In order to carry out the agreement between the British Ministry of Food and the Canadian Government, what was known originally as the Canadian Bacon Board, was organized and commenced functioning on December 22, 1939. Early in 1943 the responsibilities of the Canadian Bacon Board were enlarged and the name broadened to the Canadian Meat Board. The general functions of the Canadian Meat Board in relation to the bacon contracts may be summarized as follows:

(1) To ensure regular supplies of bacon as required.

(2) To arrange price differentials between grades of bacon so as to ensure pre-war quality.

(3) To regulate marketings to see that export requirements will be available.

(4) To store bacon in order to supplement supply in seasons when current marketings are inadequate.

(5) To see that hog prices bear a fair relationship to the agreed price for bacon.

(6) To pay storage charges.

The Meat Board purchases bacon from the individual processor of hogs in Canada for delivery to the United Kingdom, sets the grades and prices paid for the various grades of Wiltshire sides, inspects bacon at the seaboard and in general does everything

possible to keep regular supplies of bacon moving forward for shipment to Britain and at the same time protect the interests of the producer. The Canadian Meat Board does not have any jurisdiction over the carcass grading of hogs.

The Type of Pig to be Raised

Keeping in mind the importance of the British market as an outlet for Canadian pork products, and the fact that under the terms of the Canadian-United Kingdom Bacon Agreement, 75 per cent of the pork shipped to Britain under the terms of the contract must be in the form of Wiltshire sides, it is well to consider now what is mean by the term "Wiltshire side" and what type of pig we must produce to yield Wiltshire sides of the best quality.

A Wiltshire Side

The term "Wiltshire," unlike Yorkshire or Berkshire, does not refer to a breed of pig but to a particular style of dressing the hog carcass. A "Wiltshire side" is one-half of the carcass of a pig with head, feet, shoulder blade, leaf-lard, tenderloin, neck bone, back bone, tail bone and minor trimmings removed. An average 200 pound hog will yield approximately 150 pounds of warm carcass weight and 145 pounds of cold carcass weight. When the carcass is split and trimmed it will yield two Wiltshire sides of about 57 to 58 pounds in weight.

Britain's bacon trade in normal times centres very largely around the Wiltshire side and when this product is properly cured and smoked it constitutes an attractive article.

Wiltshire sides such as shown in Fig. 2, page 18, are packed, four to a bale, and since they only receive a comparatively mild cure in Canada, must be shipped to Britain with the least possible delay.

Requirements of a Choice Wiltshire

In order to receive the highest grading and bring the top price, Wiltshire sides must meet certain specifications, among them being the following:

(1) Uniform weights ranging from 55 to 65 pounds. Wiltshires within these weights sell for the highest prices. Those of heavier or lighter weights are likely to sell at a discount. Hogs marketed at live weights from 190 to 210 pounds yield Wiltshires of proper weight.

(2) Good length from the first rib to the hip bone, since this is the highest priced portion of the side.

(3) Shoulders light, as the shoulder cuts are lower priced.

Fig. 2.—Wiltshire side. Note the length from hip bone to first rib and the uniform depth of back fat.

(4) Ham trim, but well developed and carried with meat well down to the hock. The ham or "gammon" as it is called in the British trade, is a comparatively high priced cut.

(5) Evidences of a high percentage of lean meat as indicated by lack of any excess fat. An even covering of fat from 1¼ to 1½ inches along the back is most desirable.

(6) Belly thick, as indicated by fullness and firmness in the region of the flank.

Type of Pig to Produce High Class Wiltshires

It would seem quite clear that if we are to supply Great Britain with Wiltshire sides of superior quality and at the same time make available to Canadian consumers pork products carrying a high percentage of lean meat, our aim should be the production of pigs of the bacon type. Pigs of bacon type are recognized universally as the only kind which can be utilized satisfactorily in the production of lean pork, and in a country such as Denmark, which for many years dominated the British bacon market, pigs of this type were the only kind which farmers were permitted to raise.

Fig. 3—A pig of select bacon type. Note the long side, deep flank, strong loin and full, trim ham. Pigs of this type are economical feeders and produce Wiltshire sides which meet the requirements of a discriminating market.

In general type, bacon hogs are slightly long of leg, a feature which gives them a style and alertness not found in pigs of the old lard, or butcher type. The bone must be strong and clean and the pig must stand up well on its pasterns. Length of side is a feature of prime importance, and this length is estimated from just behind the shoulder to the hip joint. The shoulder must be smooth, showing no tendency to bulge on the side; an even arch of back from

neck to tail without heaviness at the neck or "crest" indicates uniformity of fleshing, and an evenness of width throughout the body suggests good development of back, loin and ham in relation to shoulder. The bacon hog should show fair depth of body in order to insure good feeding qualities. Constitution is indicated by width between the eyes, and between the forelegs, and lack of over refinement of bone. Freedom from excess fat at the jowl, underline, and ham facings insures a leanness of carcass and freedom from waste which is highly desirable. Bacon hogs of this type killed at weights of from 190 to 210 pounds produce Wiltshire sides of acceptable quality and weight. Hogs of this type are economical feeders, and are admirably adapted to make use of the kind of cereals which are raised on the farms of Alberta. Experimental evidence is at hand to show that pigs of correct bacon type grow as well and do not require any more feed than pigs of a thicker type.

Bacon Type Breeding Stock

If market hogs of the proper type are to be produced, the breeding stock must show the characteristics desired in the offspring to be sold. The type of pigs marketed will depend very largely on the class of sow kept and the type of boar to which she is mated. Whether pure-bred or grade, a sow should be selected out of a litter of good size and preferably from a sow of good disposition and possessing good milking qualities. Bacon type sows must show plenty of length of side and at the same time sufficient depth of body to insure good feeding and breeding capacity. Strength of constitution should not be sacrificed for length. Young bacon type sows should show good fleshing qualities of back, loin and ham, and must stand straight in the pasterns. Sows that are "bare on top" are apt to

Fig. 4.—A pure-bred boar should always be used. This Yorkshire boar has a long, deep, symmetrical body, supported on straight, clean-cut legs of medium length.

produce late finishing pigs. A good sow should possess twelve, or better still, fourteen teats, as mammary development will be a main limiting factor in the production of large litters. The sow should be feminine in appearance and free from any tendency towards coarseness and "stagginess".

A pure bred boar should always be used, and in selecting a boar the type of sows to which he is to be mated should be given careful consideration. If the sows show exceptional length and a tendency toward lack of constitution, a boar of moderate length but possessing a strong constitution should be used. Likewise, if the sows lack length, this feature should be a dominant characteristic of the boar selected. In the main, the bacon type boar should be masculine, should show a ruggedness of bone, without coarseness, good length with strength of constitution, together with strength of top and smoothness and evenness throughout. It should be borne in mind that boars of the proper type are a very important factor in improving the quality of commercial pigs, since a good breeding boar may be mated to a large number of sows, and for that reason great care should be taken in the selection of this member of the herd.

In selecting breeding stock care should be exercised to choose from litters which do not contain any individuals showing ruptures, ridglings or hermaphrodites. These conditions are hereditary and can only be eliminated within a herd by selecting from strains which are free of such defects.

The Bacon Type Breeds

While the matter of type is probably of greater importance than the breed in the selection of breeding stock, yet it is well to consider the merits of the various breeds so that an intelligent selection may be made. A good many breeds of American and European origin have made their appearance in Alberta, but it is generally recognized that the only breeds which are likely to produce a high percentage of pigs of correct bacon type are the Yorkshires, Tamworths and Canadian-type Berkshire. While a certain number of pigs of the bacon type may be secured from such breeds as the Duroc-Jersey, Poland-China, Chester White and Hampshire, they too often lack the length and quality of finish necessary to yield high class Wiltshire sides. These breeds were developed under conditions where bacon producing feeds were not dominant and lean pork was not demanded, and it is not to their discredit that they do not fit well into the bacon scheme.

The Yorkshire

The Yorkshire breed is generally recognized as the premier bacon breed, and is extensively used in all countries where the aim is

bacon production. In such countries as the Irish Free State, Denmark, Holland and England (where the breed originated), the majority of the pigs being slaughtered show the influence of Yorkshire blood. In Eastern Canada the Yorkshire has long been a popular breed, but only since the Dominion Government's hog grading policy was introduced in 1922 has the Yorkshire been extensively used in Alberta. Since the general introduction of Yorkshire breeding stock following that date, a marked improvement in the quality of the pigs being marketed has been noted. In all of the provinces of Canada the Yorkshire far outnumbers all other breeds combined.

The Yorkshire is a pure white breed, black hair and skin spots being objectionable. The breed is noted for its size, mature boars weighing from 700 to 800 pounds and mature sows from 600 to 700 pounds. Length of body is a prominent characteristic of the breed.

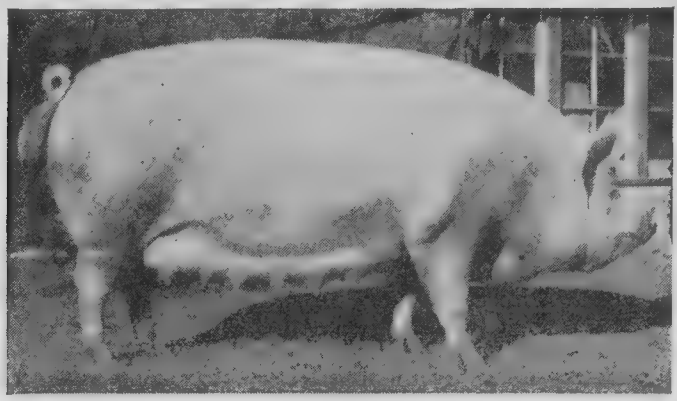


Fig. 5—Body type and a well developed mammary system should be stressed in the selection of brood sows.

Yorkshire sows are generally very prolific, and as a rule have the necessary mammary development to nurse large litters. Certain strains of Yorkshires tend to lack somewhat in constitution and feeding qualities, and a susceptibility to sunscald under certain conditions has made the breed unpopular on some Alberta farms. When Yorkshires possessing not only length of body, but strength of constitution as well are selected, and simple though definite precautions are taken to prevent sunscalding, there appears to be no doubt that this breed provides the surest means of attaining the production of a high percentage of select bacon hogs.

The Tamworth

The Tamworth is one of the oldest breeds of pigs, and has been noted from the beginning as a producer of good quality bacon. A

golden red is the typical color; black skin and hair spots should be eliminated. As a breed, the Tamworth is scarcely as large as the Yorkshire, although boars will weigh from 600 to 700 pounds and sows from 500 to 600 pounds when mature.

Tamworth pigs show a good depth of side, but as compared with the Yorkshires lack somewhat in length of side and tend to be light in the hindquarters. On the whole, however, the Tamworth seems to possess good fleshing of back and loin, and it is rare for pigs of this breed to lack the necessary finish at weights from 200 to 210 pounds.

Tamworth sows, as a rule, as not so prolific as Yorkshires, and young sows especially are inclined to give rather small litters. Improvement in prolificacy is a requirement of the breed at the present time. The following table shows the relative size of litters of the three breeds under discussion. The figures presented are compiled from our farrowing records at the University of Alberta for the years 1922 to 1940 inclusive:

Fig. 6—A champion Tamworth sow.

TABLE V.—AVERAGE SIZE OF LITTERS OF VARIOUS BREEDS

	No. of Farrowings	Total Pigs Farrowed	Av. Size of Litter
Yorkshire	482	5,285	11.0
Tamworth	518	4,669	9.0
Berkshire	169	1,404	8.3

The swine raiser who is aiming to produce hogs of the bacon type and who objects to the white color may well select the Tamworth as a breed with many splendid qualities. In selecting pigs

of this breed, length as well as development of hindquarters should be kept in mind.

The Berkshire

The Berkshire has never been recognized as a bacon breed, but what is known as the Canadian type Berkshire has been developed along bacon lines. Certain breeders have developed a type which shows sufficient length to yield carcasses of passable type, but the black color is a limiting factor in the use of this breed for purposes of bacon production in view of the objectionable skin color and the tendency toward the production of "seedy" bacon. Berkshire sows may be crossed with Yorkshire boars, producing white pigs of bacon type.

Fig. 7—Reserve Grand Champion Berkshire boar at Canadian National Exhibition, Toronto, 1940.

Swine Improvement Policies

In an endeavour to standardize the type of hogs reaching Canadian markets and to encourage the general production of pigs conforming to the bacon type, certain Federal and Provincial Government swine policies have been put into effect. Such policies are common to all countries concerned with catering to an exacting export market, and it should be borne in mind by Alberta swine producers that practically all European countries exercise very rigid government control over the swine industry. Such control is considered absolutely necessary if a standardized, high-grade article is to be secured. The view is held that any breed, breeding method, or feeding method which is detrimental to the general uniformity of the export product, must be eliminated for the common good.

Carcass Grading of Hogs

Chief among the policies having as their object the improving of the quality and standardizing the weights of Canadian Wiltshire sides, may be mentioned the Dominion Government plan of carcass grading of hogs.

The general plan of hog grading which was put into effect in 1922 had as its object the grading by official Government graders of all hogs offered at Canadian Stock Yards and Packing Plants, and the payment of a premium for pigs of the type, weight and quality suitable in the production of the highest grade of export bacon.

All hogs were graded alive until 1934, at which time an alternative plan of selling hogs on a basis of carcass grade was made available to producers. From 1934 to September 1st, 1940, the swine raiser had the option of selling his hogs according to "live" or "carcass" grade. During this period the percentage of hogs graded in the carcass increased annually as producers became acquainted with carcass grading procedure and the advantages which the system offered to the producer of hogs of top quality. According to official figures, during the first nine months of 1940, approximately 65 percent of the hogs marketed in Canada were carcass graded under the optional system.

Commencing with October 1st, 1940, carcass grading of hogs became the official system and live grading was discontinued.

Full particulars regarding the application of rail grading may be obtained from the Livestock and Livestock Products Division, Marketing Service, Department of Agriculture, Ottawa, or through the Supervising Grader at the Calgary and Edmonton Stockyards.

For the convenience of readers of this bulletin, the official hog carcass grades in effect at the time of publication are set out as follows:

STANDARD FOR GRADES OF HOG CARCASSES

(a) Weight Ranges and Carcass Measurements

GRADE "A":			
Weight			140-170 lbs.
Minimum length			29"
Maximum shoulder fat			2"
Maximum loin fat			1½"
GRADE "B":	Class 1	Class 2	Class 3
Weight	135-175 lbs.	125-134 lbs.	176-185 lbs.
Min. length according to weight	28"-29"	27"	30"
Max. shoulder fat according to wt.	2"-2¾"	2"	2¾"
Max. loin fat according to wt.	1½"-2"	1½"	2¼"
GRADE "C":			
Weight			120-185 lbs.
Max. shoulder fat according to wt.			2¼"-3¼"
Max. loin fat according to wt.			1¾"-2½"
GRADE "D":			
Weight			120-185 lbs.

and underfinished, rough, soft or oily carcasses of any weight.

LIGHTS—Weight 119 lbs. and under.

HEAVIES—Weight 186 lbs. to 195 lbs.

EXTRA HEAVIES—Weight 196 lbs. and over.

PHYSICAL INJURY—All weights.
RIDGLINGS—All weights.
STAGS—All weights.
SOWS, Class 1—All weights.
SOWS, Class 2—All weights.

REJECTED OR CONDEMNED CARCASSES shall be graded in accordance with the above grades, and in addition shall be shown separately on the Grading Certificate as Rejected or Condemned.

(b) Grade Standards

GRADE "A":
All carcasses shall be of best quality.
Shoulder—Shall be balanced in weight in relation to the ham.
Belly—Thick and of even width throughout, with full flank.
Ham—Full fleshed, evenly covered with fat of good shape.
Back—Fat firm and of even thickness within variation allowed.
Quality—Fat firm and white with proper balance of fleshing and fat in carcass throughout. Skin shall be smooth and show no marked evidence of dark hair roots or pigment.

GRADE "B":
Grade "B" may vary from Grade "A" in any weight class as follows:
Classes 1 and 3—
Shoulder—Slightly heavy or slightly fat.
Belly—Slightly thin or fat or wide.
Ham—A little thin or slightly fat.
Back—Fat slightly uneven on back or slightly deficient or a little overfat throughout the carcass.
Quality—Fat a little soft or somewhat out of balance between lean or fat.
Class 2—
Shoulder—Slightly heavy.
Belly—Thin or uneven.
Ham—A little thin.
Back—Fat slightly uneven on back or slightly deficient.
Quality—Fat a little soft.

GRADE "C":
Shall be well finished and of good quality of fleshing, but may vary from Grade "B" by including a greater degree of fat to lean, softness and unevenness of fat, heaviness of shoulder and roundness of rib.

GRADE "D":
May contain overfat, unfinished, rough, soft or oily carcasses.

LIGHTS:
This grade shall include all carcasses of reasonable finish and quality within the prescribed weights, but shall not include thin or under-finished carcasses.

HEAVIES:
This grade shall include all carcasses of reasonable finish and quality within the prescribed weights, but shall not include thin or under-finished carcasses.

EXTRA HEAVIES:
This grade shall include all carcasses of reasonable finish and quality within the prescribed weights, but shall not include thin or under-finished carcasses.

PHYSICAL INJURY:
Carcasses that have suffered serious physical damage.

RIDGLINGS:
Carcasses from ridgling pigs.

STAGS:
Carcasses from boars which have been castrated and healed.

SOWS:
All females that have raised one or more litters.
Class 1—Carcasses of good fleshing throughout.
Class 2—Carcasses that are overly fat or very thin.

REJECTED OR CONDEMNED:
Carcasses that are rejected or condemned by the Veterinary Inspector on account of disease shall be graded Rejected or Condemned.

METHOD OF MEASUREMENT

Measurement for the length of the carcass shall be taken from the front edge of the first rib to the inside of the aitch bone.

Fat measurements shall be taken as follows:
Maximum shoulder—At the point of maximum fat thickness on the shoulder, except for any small fat infiltration into the lean.
Maximum loin—At the point of maximum fat thickness on the loin between the last rib and the tail.

Carcass weights shall be "Warm Weights," including the head, leaflard, the tongue, kidneys, tenderloins, tail, backbone and feet.

Whip marks, scratches, and bruises shall not be a factor in determining grade except those graded as serious physical damage.

The price paid for hog carcasses varies according to grade. Payment according to grade offers some reward to the producer who markets a top quality product and tends to discourage the production of hogs which yield carcasses unsuitable for the best bacon trade.

The original agreement when live hog grading was started in 1922 called for the payment of a 10% premium on "selects" over "thick smooths". This arrangement continued until 1929 when the live grades were modified. At this stage the basis for paying the premium was revised to a straight increase of 50c per hundredweight for "selects" over pigs of the second grade (bacon). When carcass grading commenced in 1940 the premium was set at $1.00 per carcass for "A" grade as compared with the basic price for "B" grade carcasses. The lower grades were subject to standard price discounts.

Commencing with January, 1944, a further revision in the system of paying premiums and levying discounts was put into effect. The $1.00 premium paid by packers for Grade A carcasses became a part of the price paid for carcasses of that grade. The spread in price between grades was to be based on the carcass grade value for export bacon. These prices are subject to the approval of the Canadian Meat Board.

The Dominion Government then commenced the payment of premiums of $3.00 for "A" grade and $2.00 for "$B_1$" grade carcasses. In 1947 these premiums were changed to $2.00 and $1.00 for "A" and "$B_1$" grades respectively.

Advanced Registry for Swine

A Dominion Government Policy which is making an important contribution to swine improvement is known as the Advanced Registry Policy for Swine. This scheme seeks to identify the best producing sows and boars in pure-bred herds and puts a premium on litter size, early maturity and carcass quality. The breeder owning sows and boars qualifying under this scheme is in a position to supply superior breeding stock to commercial producers, and incidentally is entitled to a premium for stock from proven ancestry. A Pig Testing Station to facilitate the carrying out of this Policy is in operation near the City of Edmonton. Information regarding this scheme may be secured from the District Fieldman, Livestock Production Services, Dominion Department of Agriculture, Edmonton.

Other Federal Swine Policies

In addition to the policies discussed, the Dominion Government has in operation a number of other swine improvement policies. These include brood sow distribution, gilt culling, sire purchase and

the loaning of boars to Junior Swine Clubs and Swine Improvement Associations. Farmers interested in taking advantage of any of these forms of assistance are advised to communicate with the District Fieldman, Livestock Production Services, Dominion Department of Agriculture, Edmonton.

Provincial Swine Policies

The Alberta Department of Agriculture, through the Live Stock Branch, offers the Swine Improvement Policy for the placement of pure bred sires. It is designed to assist in supplying approved sires in particular to commercial swine producers in the province. Under this Policy transportation charges are paid on Government-purchased pure bred bacon type boars to the nearest shipping point of the applicant.

Applicants for sows and those who are not eligible for boars under the Swine Improvement Policy may obtain breeding stock through the Live Stock Listing Bureau. This plan does not provide for free transportation.

The Dominion-Provincial Sow Distribution Policy provides for selection and placement at cost, of good bacon type sows to organized breeding groups comprising at least five members and requiring not less than twenty sows. The Dominion Government supplies a boar free of charge. Transportation charges are shared equally by the Dominion and the Provincial Governments.

General assistance on the subject of breeding, feeding and management of swine is provided to all swine growers and breeders by the Live Stock Branch, Department of Agriculture, Edmonton, and by District Agriculturists representing the Department at various points throughout the province.

Swine Clubs

Among the agencies which have been responsible for marked improvement in the quality of Alberta hogs of recent years are the Boys' and Girls' Swine Clubs. These clubs, which are supported by both Dominion and Provincial Governments, not only interest the young people in raising good pigs, but are centres of swine improvement which work into extensive areas. Communities interested in organizing a swine club may secure information regarding this movement from the Supervisor of Boys' and Girls' Clubs, Department of Agriculture, Edmonton, or from their nearest District Agriculturist.

Scale of Operations

As a general rule the pig business is subsidiary to some other branch or branches of the farm enterprise, and it would seem that the greatest returns are to be secured from pigs when they occupy

this position. When only a few sows are kept a considerable portion of the feed supply is in the nature of "odds and ends" about the farm, and the grain allowance is supplemented by a certain amount of dairy by-products or household refuse. Under such conditions the feed bill to be charged to the pigs is not heavy and good returns can be readily calculated. It is a mistake to estimate that twenty sows will give twenty times the returns that one sow will, for when the numbers are multiplied the drain on the grain supply is heavier, and in order to compensate for the scarcity of milk and household garbage, some supplementary feeds must be purchased. At the same time, as has been pointed out previously, even when the higher grades of grain are fed, and supplementary feeds are utilized, fairly large scale pig raising can be profitably carried on over a period of years. The inexperienced pig raiser will, however, be well advised to carry on in a small way until he has a chance to study the efficiency of his methods in the light of the returns which he is securing.

FEEDING AND MANAGEMENT OF SWINE

In connection with swine raising, considerable progress has been made when the correct type of breeding stock has been secured, but the ideal in market hog production will not be attained unless the best feeding and management methods are followed. Unless the breeding stock is maintained in vigorous condition and the young pigs are kept growing from the start on well balanced feeds, the "pork making machinery" is not likely to function efficiently. The aim in the pig business should be the marketing each year of a maximum number of pigs on a minimum amount of feed, or, in other words, economical production.

During the past twenty-eight years a considerable number of swine feeding experiments have been conducted at the University of Alberta. The main objects of these experiments have been to study rations, supplementary feeding, and methods of feeding with a view to determining the feed combinations and methods of feeding which will produce an acceptable type of pig at the lowest possible feed cost, and during a feeding period of minimum length. It will be the object of the discussion which follows to present to swine raisers a review of swine feeding and management problems based on the results of experiments conducted at the University of Alberta, with the hope that it may be of some service, particularly to those who may have had comparatively little previous experience with hogs.

Composition of Common Swine Feeds

Before commencing a discussion of feeding and management practices, however, it should be of interest to consider some facts

relative to the composition of common swine feeds and to draw some general comparisons between the various feeds available to Alberta swine producers.

A very good idea of the comparative value of various feeds may be secured by subjecting them to a chemical analysis. The chemist groups the various components of feeds under the following headings: water, ash, crude protein, fibre, carbohydrates and fat. The constituents of oats, for example, are grouped in this way because each of these groups plays a definite and different part in connection with body up-keep and growth.

The moisture content is determined because the less moisture a feed contains the higher its feeding value, pound for pound. Cereals which are damp or tough do not return as good value for each 100 pounds fed as those of lower moisture content.

The ash contains the mineral constituents of the feed, and unless additional mineral matter is fed, the ash forms the only source of supply of mineral for the animal. The ordinary farm-grown grains are very low in ash. The hays and grasses contain more ash; such hays as alfalfa and the clovers are very rich in mineral matter, especially lime. Since pigs are fed heavily on cereals, it is necessary to pay careful attention to mineral supplements.

The crude protein contains all the nitrogenous compounds, and this part of the feed is used to produce lean meat, body tissue, hair, skin, hoof, etc. The demand for protein is very heavy in young growing pigs, pregnant sows and sows nursing litters. The bacon hog, which is a producer of lean meat, requires a plentiful supply of protein rich feeds. Such feeds as skim-milk, tankage, linseed oil meal, fish meal and bran are rich in protein.

The fibre is the part of the feed stuff which is of least use to the pig. Oat hulls consist largely of fibre and are to a large extent indigestible. Cattle and sheep can make considerable use of fibrous feeds because they have a large paunch and chew the cud, but the pig with its small stomach, can make little use of high fibre feeds. This is a point to be borne in mind in pig feeding.

The carbohydrates compose the starchy portion of the feed, and are largely used to supply the heat and energy required by the pig and for the production of fat in the body. Barley, wheat and corn are feeds which are rich in carbohydrates.

The term fat, when used in connection with the composition of a feed, embraces not only true fat but certain fat-like substances. The fat is used for the same purposes as the carbohydrates, namely, heat and energy and the production of body fat. If a feed is very rich in oils, especially those of a soft nature, they may adversely influence

the quality of fat in the carcass. None of the feeds commonly used in Alberta, however, are likely to cause any trouble in this respect.

A table setting out the percentage composition of various feeds may constitute a valuable guide in arriving at relative values, and for that reason the following table is submitted. A large number of chemical analyses have been made of the common feeds and a reliable average figure has been obtained. Figures relating to the content of ash, fibre, protein, carbohydrates and fats can be studied with profit.

*PERCENTAGE COMPOSITION OF SOME COMMON SWINE FEEDS

	Water	Ash	Total Protein	Fibre	Carbo-hydrates	Fat
Oats	8.9	3.6	12.0	10.6	60.2	4.7
Barley	9.6	2.9	11.8	5.7	68.0	2.0
Wheat	10.2	2.0	13.1	3.0	70.0	1.7
Corn, Dent	11.5	1.4	9.7	2.3	71.1	4.0
Rye	10.0	2.0	12.3	2.3	71.7	1.7
Shorts	9.9	4.4	17.8	6.2	57.0	4.7
Bran	9.4	6.0	15.8	9.5	54.3	5.0
Skim-milk	90.4	0.8	3.7	....	5.0	....
Butter-milk	90.6	0.8	3.5	....	4.5	....
Tankage	6.2	27.8	50.8	2.1	2.0	11.1
Linseed oil meal	8.7	5.5	35.2	8.0	36.3	6.3
Fish meal	7.5	14.7	66.7	0.7	3.6	6.8
Alfalfa hay	9.6	8.3	14.7	29.0	36.4	2.0
Potatoes	78.8	1.1	2.2	0.4	17.4	0.1
Rape pasture	83.6	2.2	2.9	2.6	8.1	0.6

*From "Feeds and Feeding," Morrison, twentieth edition.

Swine Feeds Available in Alberta

A knowledge of the comparative values of the various feeds suitable for pig feeding should be of assistance in connection with planning a cropping scheme or in getting the greatest value for money spent when feed has to be purchased. The discussion which follows, when considered in conjunction with the figures dealing with chemical composition should form a basis for evaluating the common swine feeds.

Oats.—Oats are one of the staple cereals of Alberta, and may well form a part of the ration for most classes of pigs. They may be used as part of the grain mixture for young growing pigs, brood sows, and breeding boars, but we would not recommend that they be fed as a sole grain to any class of pig unless they are the only grain available. There is a prevalent belief that good bacon hogs cannot be grown unless oats are used as a sole grain for young pigs, but we are led to the conclusion, as a result of our experimental work, that select bacon hogs can be produced by the use of such grains as wheat and barley in combination with oats, early in the pig's life. The use of the heavier grains reduces the percentage of hull in the ration, and the young pigs are able to make better use of the feed consumed. Specific recommendations regarding the percentage of oats to feed to various classes of pigs will be made later.

Barley.—Barley has long been regarded as a desirable finishing feed for pigs in this country. Of recent years we have conducted a number of experiments with a view to determining the place of barley in the ration of young growing pigs, and we are led to conclude that a much larger percentage of barley than was formerly thought possible may be fed to advantage. It has been our experience that the higher the percentage of oats in proportion to barley fed, the more feed is required to make growth, and the smaller the returns for feeding. In this connection an average result of three experiments conducted during the years 1926-27-28 is presented. In these experiments the various grain mixtures were fed in conjunction with skim-milk to pigs running on pasture.

The results of these experiments appear to justify the conclusion that while oats have been considered a particularly valuable feed for bacon hogs, when the cropping scheme favors the growing of barley, or when the relative prices of these two grains is in favor of barley feeding, a higher proportion of barley than has been common may be safely and economically fed.

TABLE VI.—RESULTS OF FEEDING VARIOUS MIXTURES OF OATS AND BARLEY FROM WEANING TIME TO MARKET WEIGHT

	LOT I Oats 2 Barley 1	LOT II Oats 1 Barley 1	LOT III Oats 1 Barley 2	LOT IV Oats 1 Barley 3	LOT V Barley Alone
No. of pigs	20	20	20	20	19
Av. initial wt. lbs.	35.71	36.11	36.15	36.15	35.79
Av. final wt. lbs.	205.36	203.01	203.09	203.06	205.02
Av. daily gain lbs.	1.28	1.31	1.33	1.35	1.37
Feed required for 100 lbs. gain:					
Grain	297.78	295.57	288.39	287.86	285.21
Skim-milk	580.56	568.77	557.04	551.66	551.33
Av. profit per head over feed cost	$10.49	$10.89	$11.06	$11.21	$11.20
Live grading of hogs:					
Select bacon	16	15	17	15	16
Thick smooth	4	5	3	5	3

Wheat.—Wheat has not been commonly thought of as a pig feed unless in the form of the frozen or lower grades, but of recent years, with the establishment of quotas and shortage of coarse grains in some areas, the place of wheat in swine rationing has been prominently to the fore. The introduction of new early maturing, high yielding varieties of wheat into the barley territory has also been a factor in drawing attention to the value of this cereal in pig feeding.

An experiment conducted at the University of Alberta during the fall of 1928, with a good grade of frozen wheat for finishing pigs weighing approximately 130 pounds indicated that good feed wheat had a slightly higher feeding value than 3 C.W. barley, 100 lbs. of wheat being equal to 116 lbs. of barley. In this experiment No. 3 and No. 4 wheat did not give any better results than the good feed wheat. With pigs selling at $8.00 per cwt. live weight, the

wheat was marketed through pigs at $1.15 per bushel as compared with 50c per bushel at the elevator.

In an experiment conducted during the summer of 1929, when pigs were allowed to help themselves to ground wheat, oats and barley from separate self-feeders, they showed a decided preference for wheat, and the greater the proportion of wheat consumed the smaller was the amount of feed required to produced 100 pounds of gain. The pigs fed wheat graded out well on foot and produced Wiltshire sides of desirable quality.

While in some areas it has been considered an extravagance to feed wheat to pigs, it would appear that this cereal could with profit be incorporated in our swine rations.

Comparative Values of Oats, Barley and Wheat

Some idea of the comparative value of the three common farm grains for growing pigs may be gained from an experiment conducted during the summer of 1933 with pigs starting on experiment with a weight of from 55 to 60 pounds and carrying through until a weight of approximately 200 pounds was reached. These pigs were fed in dry pens without pasture. Tankage was added to the ground grains at a rate of 8 per cent, and the pigs had access to the simple mineral mixture outlined on page 42. In addition to groups being fed the individual grains, a fourth group was fed the three grains mixed equal parts by weight. The results of this experiment are shown in Table VII.

TABLE VII.—COMPARISON OF OATS, BARLEY AND WHEAT FOR GROWING PIGS

		LOT I	LOT II	LOT III	LOT IV
		Oats Tankage 8 per cent	Barley Tankage 8 per cent	Wheat Tankage 8 per cent	Oats 1 Barley 1 Wheat 1 Tankage 8%
No. of pigs		9	7	9	8
Av. initial weight	lbs.	59.30	54.47	57.92	61.59
Av. final wt.	lbs.	190.11	208.57	199.78	195.38
Av. daily gain	lbs.	1.15	1.29	1.28	1.38
Feed consumed for 100 lbs. gain:					
Oats	lbs.	408.47	.....	.....	107.67
Barley	lbs.	.....	376.22	.....	107.67
Wheat	lbs.	.....	.....	353.72	107.67
Tankage	lbs.	35.52	32.71	30.76	28.09
Total grain and tankage	lbs.	443.99	408.93	384.48	351.10

It will be noted from the above table that the pigs fed barley and wheat grew at about the same rate and more than one-tenth of a pound per day faster than those fed oats. Wheat proved the most efficient grain, followed by barley and then oats on the basis of pounds of feed required to produce 100 pounds live weight of pig. In this experiment the amount of gain produced by 100 lbs. of ground oats was produced by 92 pounds of barley, 87 pounds of wheat and 79 pounds of grain when the three were mixed.

Rye.—This grain is grown quite extensively in some parts of Alberta, and in these areas is relied upon to a considerable extent as pig feed. Compared with the grains already discussed it is an inferior pig feed, lacking in palatability and inefficient in promoting growth when fed alone. In connection with experiments conducted in 1923 and 1924 with finishing pigs, it was found that the pigs took very unkindly to the rye when it was fed as a sole grain, and was only worth 70% as much as barley as a finishing grain. When mixed with oats and barley, or either grain alone, it could be used satisfactorily and economically.

Corn.—This cereal does not occupy a prominent position in pig feeding in Alberta, but improvement in varieties may extend the corn belt at least to the extent of making the crop available for hogging down purposes. On account of its tendency toward fat production and a slight softening effect on the carcass, corn is not favored as a bacon feed, but when mixed with other grains and balanced with milk or other suitable supplements, it might constitute from one-quarter to one-third of the ration.

Screenings.—The question is often asked as to what part screenings may play in pig raising. Screenings of the quality of "standard recleaned" screenings, containing mainly small cracked grains, wild oats, and buckwheat, and free from the small weed seeds, constitute a useful pig feed. In an experiment conducted during the summer of 1926, pigs fed ground recleaned screenings along with 5% of tankage made an average daily gain of 1.09 pounds, and only required 394.0 pounds of feed to make 100 pounds of gain. The screenings actually cost $18.00 per ton, and were marketed through the pigs selling at $10.00 per cwt. at $50.80 per ton.

Again, in an experiment carried out during the winter of 1933-34 pigs fed standard recleaned screenings with 8% of tankage gained 1.28 pounds per day and required 454 pounds of the screenings for 100 lbs. live weight gain. Screenings which cost $7.00 per ton were marketed through $6.75 hogs at $30.20 per ton.

Weed Seeds.—While weed seeds are usually utilized in the form of screenings and are thus fed mixed with small or cracked wheat or other grains, there may be times of emergency when they constitute the only feed supply. Of the various weed seeds, wild oats can be utilized to best advantage, and in an experiment conducted during the winter of 1933-34 it was found that wild oats had as high a feeding value as good feed oats. Wild buckwheat has a fairly high feeding value and pig weed seed when mixed with grains can be made use of in pig feeding. In connection with an experiment conducted at the University of Alberta during the winter of 1937-38, when ground pig-weed seed was fed along with ground oats and

barley and a supplement added in addition, it was found that pig weed seed had a feeding value of approximately 90% of that of oats. Seeds of the mustards and stink weed are objectionable and pigs will usually refuse to eat mixtures which contain these seeds in any quantity. All weed seeds should be well ground before feeding.

Shorts or Middlings.—Shorts or middlings have always been regarded as very desirable pig feeds. We conclude after a series of experiments that this feed can not be used with profit unless it can be purchased at a smaller cost per pound than grains are worth on the farm. They have been regarded as a traditional feed for pigs after weaning, but an average result of three experiments conducted in 1924-25-26 covering the month following weaning suggests that farm grown grains may take their place.

If farm grains are of poor quality or are not well ground, shorts will improve the palatability of a mixture and will have a higher feeding value than when good, well ground grains are available.

TABLE VIII.—SHORTS FOR WEANLING PIGS

	LOT I Oats 2, Barley 1 Barley 1 Skim-milk	LOT II Oats 2, Barley 1 Shorts 1 Skim-milk
No. of pigs	19	19
No. of days fed	28	28
Av. initial wt. lbs.	34.37	34.58
Av. final wt. lbs.	58.13	52.67
Av. daily gain lbs.	.86	.66
Feed required for 100 lbs. gain:		
Grain lbs.	188.37	232.37
Skim-milk lbs.	542.16	664.39
Cost of 100 lbs. gain	$3.84	$4.79

Bran.—Bran may with advantage be used up to one-half the ration for brood sows prior to farrowing and immediately after farrowing. It is cooling and laxative, and as a result is valuable as a sow feed. Under certain price conditions its use may be recommended for other classes of pigs, but ordinarily its place is limited in economical pig feeding.

Skim-milk.—This is a supplementary feed for pigs par excellence, and pig raisers who have skim-milk available are in a fortunate position. As a feed it is rich in protein required for the production of lean meat and in mineral matter required for the growth of a sound body framework. It is valuable in compensating for some of the deficiencies of farm grown grains, and when supplementing the cereals makes for very economical production. A good deal of Denmark's success in bacon hog production is attributed to the abundant supply of skim-milk in that country.

We are frequently asked as to the value of skim-milk, or what one could afford to pay for it if it could be purchased. Such a figure can best be arrived at by determining the amount of grain which it

will replace in pig feeding. This was done in a series of experiments conducted in 1923-24-25 when the influence of skim-milk as compared with other supplements on the quality of the carcass was being studied. Our conclusions as presented in Bulletin No. 15 were as follows:

Grain Prices per pound	Value of Skim-milk per 100 lbs.
½c	16.43c
¾c	24.65c
1c	32.87c
1¼c	41.08c
1½c	49.03c
1¾c	57.05c
2c	65.74c

The value of skim-milk depends upon the rate at which it is fed; and in this connection we recommend the following proportions of grain and skim-milk:

Weaning time to 80 pounds	2.5 lbs. to 1 lb. of grain
80 pounds to 125 pounds	2 lbs. to 1 lb. of grain
125 pounds to market weight	1 lb. to 1 lb. of grain

Buttermilk.—What has been said regarding the place of skim-milk in pig feeding holds equally well for buttermilk as it comes from the churn. Buttermilk diluted with wash water or containing a high percentage of any added materials will have a lower feeding value.

Tankage.—In tankage, which is a packing house by-product, consisting of thoroughly cooked and sterilized meat and bone scraps, Alberta farmers have a valuable pig feed and a useful substitute for skim-milk. Tankage serves as a combined protein and mineral supplement. Numerous experiments which we have conducted at the University of Alberta indicate the value of this supplement for young, growing pigs when skim-milk is not available. Space will not permit the presentation of any volume of data from these trials, but the following table summarizing the results of a series of three experiments conducted during the summers of 1923-24 and 25, with pigs self-fed their grain and running on rape pasture, will give some idea of the value of this feed. In this experiment tankage was fed at the rate of 10 pounds to 90 pounds of grain throughout the trial. Tankage was valued at $50.00 per ton and skim-milk at 30c per 100 lbs.

TABLE IX.—A COMPARISON OF SKIM-MILK AND TANKAGE

	LOT I Grain Skim-milk Pasture	LOT II Grain Tankage Pasture	LOT III Grain Alone Pasture
No. of pigs in lot	21	21	21
Av. number of days on feed	119.5	129.0	214.2
Av. daily gain lbs.	1.31	1.24	.74
Feed required for 100 lbs. gain:			
Grain lbs.	321.63	392.76	611.84
Skim-milk lbs.	694.96	.....	.....
Tankage lbs.	.....	42.12	.....
Cost of 100 lbs. gain	$6.14	$5.97	$7.38

While tankage can be used satisfactorily as a single supplement, the volume available in Alberta in relation to the pig population tends to suggest that it can be used to best advantage when incorporated in mixed supplements.

Linseed Oil Meal.—While linseed oil meal may be fed to advantage in small quantities to brood sows before farrowing, and while nursing litters, it does not seem to have a high value as a sole substitute for skim-milk for growing pigs. In connection with experiments conducted during the winters of 1925-26 and 1926-27 it gave the least satisfactory results of a number of supplements tested from both the standpoint of rate of gain and feed requirements.

Alfalfa Meal.—Good, green alfalfa meal, particularly when made from fine leafy hay, has proven a valuable protein supplement in our winter feeding experiments when the feeding of grain with 5% of alfalfa meal has been checked against the feeding of grain alone, but in comparison with tankage or a mixture of the supplements it has not rated high. Its high fibre content tends to cut down the rate of growth. Its value in the feeding of growing pigs appears to lie in its being fed in small proportions in a combination supplement or fed by the free choice method on farms where it can be produced. In addition to supplying protein, alfalfa is a good source of vitamins A and D, both of which are important in pig feeding.

Alfalfa meal is a very valuable feed for brood sows and may be fed at the rate of 10 to 20% of the grain ration.

Fish Meal.—In European countries fish meal is used quite extensively as an addition to the grains in pig feeding. In Denmark, where it can be economically purchased, it often constitutes 10% of the meal mixture. A considerable volume of this feed is being manufactured at the Pacific coast, but under usual price conditions its general use as a single supplement cannot be recommended. It may be added in limited quantities to improve a supplemental mixture.

Mixed Supplements or "Hog Concentrates".—Each of the individual protein and mineral supplements already mentioned can be used to advantage in pig feeding. However, the best results from the standpoint of rapid gains and economical production are usually secured when several of them are blended together in such proportions as will provide a complete mixture. This process can be carried out on the farm by buying the various ingredients and mixing them according to a standard formula. Difficulty is experienced sometimes in the weighing out of the individual materials and getting a good "mix" is difficult unless a mechanical mixer is available. At the same time the labor involved is considerable.

The alternative is to purchase ready mixed protein-mineral supplements which are commonly referred to as "hog concentrates". The mixtures offered to swine raisers by reliable feed companies are made according to standard specifications which have been drawn up on the basis of experimental findings. They provide protein, minerals, and vitamins in satisfactory proportions and amounts and the feeder may feel reasonably certain that, if these supplements are added to the grain in the proper amounts, and well mixed, good results will follow.

The mixing and sale of feeds by commercial concerns is regulated by the Dominion Department of Agriculture through the Feeding Stuffs Act. The feeds must meet certain specifications provided for in the Act and on the outside of the bag will be found information relating to the percentage of important ingredients. The feeder should check this declaration so that he may be familiar with the quality of the feed which he is purchasing.

A combined protein and mineral supplement which has proven reliable may be made up as follows:

Tankage	50 lbs.
Linseed Oil Meal	25 lbs.
Fish Meal	15 lbs.
Ground Limestone	5 lbs.
Salt	5 lbs.
Total	100 lbs.

This mixture may be modified in a number of different ways. For example, 10 pounds of alfalfa meal may be added and the amount of linseed oil meal or fish meal reduced accordingly. In times of shortage of tankage the amount of this ingredient may be lowered and the percentage of alfalfa meal or other supplements increased. The actual composition of the mixture may be varied according to the price and availability of individual feeds.

Since tankage is the basic ingredient of most "hog concentrates" and since it may, in times of plentiful supply, be bought and used by itself, the matter of its value in relation to the "mixture" is of some interest. A glance at the table on page 31 will show that tankage contains 50% of protein while the supplements of plant origin contain this constituent in smaller amounts. The addition of such feeds as linseed oil meal and alfalfa meal to tankage will result in a lower protein content in the mixture but due to the better combination of proteins in the blended feed each pound fed will usually replace a larger amount of grain and the value of one pound of the mixture as compared with one pound of tankage is thereby increased.

The mixture suggested above contains approximately 42% protein. We have found in comparing this mixture with tankage, as a supplement to a grain ration, that it will promote slightly higher

daily gains and on the basis of extra grain saved is worth approximately 20% more per 100 pounds than tankage. In other words, if tankage is worth $75.00 per ton the mixed concentrate is worth approximately $90.00 per ton.

Since, as has been mentioned already, most mixed supplements contain less protein (for example 40%) than tankage (50%) they should be fed in slightly higher amounts. Whereas 10% of tankage added to the grain will be satisfactory for young pigs and 5% for pigs over 110 lbs. in weight, the mixture should be added at the rate of 12% and 6%.

In the discussion regarding the feeding of different classes of swine which follows it is assumed that the majority of swine feeders will be using a mixed supplement or "hog concentrate" containing approximately 40% of crude protein and recommendations will be based upon this assumption. The term "supplement" will be used in this connection.

A Balanced Ration.—While the addition of one or other of protein or mineral to a mixture of farm grains will bring about improvement in the performance of growing pigs it requires both to balance the ration properly and insure best results. This is indicated by the results of a series of experiments conducted at the University of Alberta during the years 1932 to 1934. Three groups of pigs were included. One group was fed on grain alone, one had ground limestone added to the grain, and a third had both protein and mineral added. The pigs were fed inside the piggery; 1% of salt and 1% of cod liver oil were added to the feed mixture in all lots. The results are shown in the following table:

TABLE X.—PROTEIN AND MINERAL ADDED TO GRAIN

	LOT I Grain Alone	LOT II Grain Mineral	LOT III Grain, Mineral Protein
Average initial wt. (lbs.)	50.7	50.3	50.1
Average final wt. (lbs.)	139.1	166.9	200.6
Average daily gain (lbs.)	.69	.92	1.27
Feed eaten per day (lbs.)	3.64	4.35	4.75
Feed required for 100 lbs. increase in wt. (lbs.)	524.8	471.9	373.2

It will be noted that the addition of mineral alone contributed to improvement, but more feed was eaten per day, the average daily gain was increased and the feed requirement for 100 pounds gain was lowered when both protein and mineral were fed.

Roots.—While roots may not be regarded as a necessity in pig feeding in Alberta, when they are available, they can be used to good advantage. They are of use for brood sows, providing bulk and succulence, but for growing pigs they tend to utilize too much valuable space in the digestive tract. Potatoes may be boiled and mixed with grain and in this way marketed through pigs in years

of low potato prices. In an experiment along this line conducted during the winter of 1922, it was found that 411 pounds of cooked potatoes equalled 100 pounds of grain in feeding value.

Pasture Crops.—Pasture crops should be utilized extensively in Alberta in connection with pig raising unless sanitary feeding pens are available and the proper balancing of rations can be undertaken. If skim-milk is plentiful or other substitutes can be liberally supplied there may be no serious need for pasture accommodation, but under the average conditions prevailing, good pasture crops will do at least two things: (1) provide more sanitary conditions than usually prevail in the pens and yards and thus to a considerable extent avoid the possibility of disease infection and worm infestation; (2) allow the pigs the opportunity of securing some of the protein, minerals and vitamins which may be lacking especially when skim-milk is not available.

Fig. 8.—General view of experimental groups of pigs on pasture at the University of Alberta

Experiments conducted at the University of Alberta in recent years indicate that when supplemental feed is not available, one may expect from 30 to 50 per cent more rapid gains and a decrease of from 20 to 30 per cent in the cost of making gains when pasture crops are used as compared with feeding in the dry lot. When proper supplements are fed pasture crops do not make such a good showing.

Crops which have been tested experimentally as hog pastures are: rape, alfalfa, sweet clover, sunflowers, mixtures of oats and fall

rye, and a cereal mixture consisting of equal parts of oats, barley and wheat. Alfalfa has proven a very valuable pasture crop for pigs, making an early start in the spring and providing a bulk of forage throughout the season. Where alfalfa can be grown it is undoubtedly the peer among swine pastures. Rape has stood next to alfalfa in our experiments. While it does not provide pasture as early as alfalfa, it has a wonderful carrying capacity under Edmonton conditions and maintains a growth until late in the season. It might be stated, however, that good results have been secured from all of the crops tried experimentally. The crops selected will depend upon local conditions, and on this point we conclude that the choice of a crop is really secondary to making provision for green forage in some form.

For the benefit of those who hesitate to use a pasture crop for their pigs on account of the tendency of pasture to cause "blistering" or "sunscalding," we would say that when suitable shelter is provided close to the feed trough or self-feeder, blistering will be reduced to a minimum. When pigs do become so afflicted, a liberal application of mineral oil to the affected parts will generally alleviate the condition.

The following table will show the relative performance of two groups of pigs, one self-fed grain in dry lot and the other self-fed the same ration on rape pasture. Tankage was fed at the low level of 5% of the grain ration in both cases, and a small allowance of buttermilk was fed in addition for the first month after the pigs were put on test. Results are based on an average of three experiments conducted during the pasture seasons of 1923, 1924 and 1925.

TABLE XI.—DRY LOT AND PASTURE FEEDING COMPARED

		GROUP I Dry Lot	GROUP II Rape Pasture
No. of pigs		22	50
Av. initial wt.	lbs.	46.18	45.8
Av. final wt.	lbs.	117.25	158.8
Av. daily gain	lbs.	.74	1.16
Feed required for 100 lbs. gain:			
Grain	lbs.	510.94	328.5
Tankage	lbs.	25.57	20.14
Buttermilk	lbs.	118.4	77.5

In connection with the use of pasture crops for pigs being fed for market, it should be kept in mind that pasture is used as a supplement to grain feeding rather than as a sole means of maintenance as in the case of cattle or sheep. Only in extreme cases of grain scarcity should pigs be forced to graze on pasture without grain or with a very small grain allowance. Best results are secured when pasture is used in conjunction with liberal grain feeding.

Brood sows can make particularly good use of pasture and every effort should be made to supply them with fresh forage from early summer until fall.

Pasture lots for market pigs should not exceed from one-half acre to one acre in size, and where a larger area is required, cross-fencing is strongly recommended.

Mineral Supplements.—In order that they may grow rapidly, pigs require an adequate supply of mineral matter for skeletal growth. This mineral matter is lacking in our ordinary farm grown grains and unless the deficiency is made up for by adding certain minerals to the feed a lack of thrift is likely to develop and such acute conditions as "stiffness," "rickets," etc., may arise. Apart from the minerals required for bone growth, the main one being lime, such minerals as iodine, which prevents the birth of "hairless pigs," and iron, which prevents anemia in young pigs, may be lacking. Conditions arising from a deficiency of these elements will, however, be mentioned under the section dealing with "swine diseases." Salt is required by pigs in small amounts.

Fig. 9.—Pigs will try to "mine" their own minerals if mineral mixtures are not provided. It is better to supply the necessary minerals and save the pigs' energy.

A simple mineral mixture which may be used with good results by keeping it before the breeding stock and growing pigs in some such self-feeder as shown on page 82 may be made up as follows:

Ground limestone	40 lbs.
Bone meal or mono-calcium phosphate	40 lbs.
Salt	20 lbs.

If a mineral mixture, either home-made or commercial, is not being self-fed or if one has reason to believe that other supplements which have been added to the grain do not supply sufficient mineral, 1 pound of ground limestone and ½ pound of salt may be mixed with each 100 pounds of the grain mixture.

That pigs respond to the feeding of ground limestone when there is a lack of this mineral in the feed is shown by the results of an experiment conducted during the winter of 1935-36. Two groups of pigs were fed in the piggery during the winter months on a grain mixture of equal parts of ground oats, barley, and wheat with the addition of salt and cod liver oil. One lot had ½ pound of ground limestone added to each 100 pounds of grain.

TABLE XII.—FEEDING GROUND LIMESTONE

	LOT I Grain No Mineral	LOT II Grain, ½% Ground Limestone
No. of pigs in lot	7	7
Av. number of days fed	161	155
Av. initial wt. ....lbs.	46.07	44.62
Av. final wt. ....lbs.	176.29	206.0
Av. daily gain ....lbs.	.81	1.04
Feed required for 100 lbs. gain:		
Grain ....lbs.	514.14	467.07
Mineral ....lbs.	.....	2.35
Cost of 100 lbs. gain	$4.23	$3.88

The pigs which did not receive the mineral grew more slowly and required more feed to make their gains than those fed the ground limestone and in addition two pigs in Lot I became badly crippled during the experimental period.

Fig. 10.—Pigs which are not receiving sufficient mineral will become crippled. This group of pigs was fed during the winter of 1933-34 at the University on a ration lacking mineral.

Fish Oils.—Pilchard oil and certain blends of fish oils are used extensively in poultry feeding and can be used to good advantage in the feeding of young pigs, especially when the system of management involves confinement in the piggery after weaning. The fish oils contain important vitamins, A (for growth) and D (for bone building). We have carried out a number of experiments at the University of Alberta in connection with the use of fish oils of commercial grade in the feeding of pigs confined to the piggery and not

allowed access to sunlight. We have found that these oils as a rule improve the growth and assist in preventing crippling. The results secured will depend to a considerable extent upon the mineral content of the ration.

Most commercial supplements contain the essential vitamins in sufficient amounts. If commercial supplements are not being used it will be well to add fish oil to the feed at the time of feeding.

The amount to be fed will depend upon the quality of the oil being used. Many of the oils commonly available at present are rated at 2,400 units of vitamin A and 400 units of vitamin D per gram, and if they are fed at the rate of one teaspoonful per day per pig until a weight of from 70 to 100 pounds is reached, satisfactory results should be secured. If mixed with the grain before feeding 1 to 1½ pounds per 1,000 pounds of grain should be sufficient. Oils which are rated at lower strengths will have to be fed in proportionately larger amounts.

Preparation of Feeds

Cooking.—It was a common practice on many farms in earlier days to cook practically all feeds for pigs, but experimental work and private experience has shown that cooking decreases the digestibility of most feeds, and adds to the cost of production. Many still feel that winter pigs do better when the feed is cooked, but on the basis of three experiments conducted during the winters of 1920-21, 1921-22, and 1922-23, when cooked grain was compared with dry grain fed from the self-feeder, we conclude that the expense of cooking the grain is not warranted. Such feeds as garbage and potatoes are better cooked, but the common grains are more economically fed without cooking. When economy is not an object, slightly better daily gains may be secured with cooked feed, and the palatability of certain mixtures may be improved.

Soaking.—Soaking grain does not seem to be good practice. Even when whole grain is soaked, conditions are not improved; this occurrence is indicated in an experiment conducted during the winter of 1931-32 at the University of Alberta. Pigs fed whole dry grain (oats and barley) gained at the rate of .98 pounds daily and required 455.35 pounds of grain for 100 pounds of gain, while those fed the same mixture after soaking between feeds gained only .76 pounds daily and required 515.26 pounds of grain to make the 100 pounds gain.

Grinding.—We are asked from time to time whether or not it pays to grind grain for pigs. This question is of special interest in times of low prices for grain and hogs. Related to this question is one concerning the degree of fineness to which grain should be

ground for pigs. In an experiment carried on during the summer of 1931, it was found that there was little difference in the rate of growth whether pigs were fed fine, medium, or coarsely ground grain, but that the finer the grinding the less grain was required to make 100 pounds increase in live weight. Based on feed requirements for gain, 100 pounds of finely ground grain was worth 104 pounds of medium ground and 112 pounds of coarsely ground grain. In connection with another experiment conducted during the winter of 1931-32 the grinding of grain resulted in the pigs making faster gains as compared with whole grain feeding. It would appear that moderately fine grinding is to be recommended with the ordinary grains if such a treatment can be given the grain at moderate cost. Wheat should not be too finely ground for pigs; a rather sharp, gritty texture is best.

Methods of Feeding

There are two methods of pig feeding commonly practised: (1) the hand-feeding method, feeding the grain either wet or dry twice or three times daily, and (2) the self-feeding method, where the self-feeder is used and grain is kept before the pigs at all times.

The method to be recommended will depend upon the number of pigs to be fed, the amount of grain on hand, and the rate of gain desired. The relative merits of the two systems have been extensively studied experimentally. The problem was carefully considered in a series of three experiments conducted at the University of Alberta during the summers of 1923, '24 and '25. Hand-feeding was compared with self-feeding with respect to rate of growth and feed requirements and with regard to their influence on the type of pig and quality of carcass produced. In view of the importance of this question the conclusions drawn from these experiments as quoted from a previous bulletin are as follows:

"Self-fed pigs invariably made more rapid gains than those that were hand-fed. In one case the feeding period was shortened by twenty days and in another by thirty-three days. In years of normal market trends, particularly with early spring pigs, this shortening of the feeding period makes possible marketing before the later season slump occurs. In the final analysis the scale of operations will usually determine whether self-feeding or hand-feeding shall be practised. When one or even two litters are being fed, the labor cost does not loom large, but when operations are conducted in a fairly large way, the labor saving properties of the self-feeder come to the fore, and tend to compensate for the slightly higher feed bill which is induced by this method of feeding. Self-feeding gave eminently satisfactory results in the development of pigs of select grade. A higher percentage of selects and a larger number of suit-

able Wiltshires were graded out of the self-fed groups, indicating that the self-feeder did not lead to too early maturity and the development of a short thick type of pig."

Since the experiments referred to above were conducted during the days of live grading, the same type of experiment was repeated in 1946 to determine whether carcasses from self-fed pigs would grade as well as those from hand-fed pigs. One of each of 16 pairs of litter mates was self-fed while the other was hand-fed. The average weight of the pigs at the start of the test was 86 lbs., and the results were as follows:

(1) Carcasses from the self-fed group were ¼ inch longer than those of the hand-fed group.

(2) The self-fed pigs had slightly more fat over the shoulder than their hand-fed litter mates.

(3) Both groups yielded the same percentage of grade "A" carcasses—87% in each case.

(4) Although the number of grade "A" carcasses was the same for both lots, more detailed carcass scoring by Advanced Registry methods showed that carcasses from the hand-fed lot were somewhat superior to those from the self-fed group. The pigs used in this test were sired by two boars, one of which was long and lean, while the other was of medium length and somewhat thicker all through. The difference in carcass quality in favor of hand-feeding which showed up under the Advanced Registry system of scoring was particularly evident in the carcasses of pigs sired by the boar of medium length and moderate thickness. This would suggest that, if the breeding stock in use is just borderline for length and thickness, self-feeding may result in a reduction in the percentage of carcasses that will qualify for the "A" grade.

The experiments suggest that a good deal of labor and often drudgery can be saved by the use of a properly constructed self-feeder, and that, if the breeding stock is of the right type, self-feeding can be practised without serious reduction in carcass quality. Particulars regarding the construction of self-feeders will be found on pages 80, 81, and 84.

Inside Pig Production

When permanent, sanitary hog houses are available, and when skim-milk or suitable substitutes are provided in adequate amounts a system of intensive inside pig feeding can be followed. Pigs may be pen fed satisfactorily from the time they are weaned until ready for market. This system involves more labor but the investment in pasture land and fencing is eliminated and the difficulty of sun scalding with white pigs is overcome.

Experiments conducted at the University of Alberta during the summers of 1934 and 1938 indicated that pigs full fed a well balanced ration and pen fed from weaning time until ready for market, made slightly more rapid gains and required less feed to make 100 pounds gain than similar pigs fed the same ration when running on pasture. The saving in feed amounted to approximately 30 pounds for each 100 pounds increase in live weight of the pigs. Pigs were finished for market without difficulty at around six months of age.

Inside pig production makes it necessary to study carefully the proper addition of supplements to the farm grown grains. If the protein, mineral and vitamin requirements of pigs are not taken care of under such a system, disappointing results are sure to follow.

Care of the Breeding Boar

Since the breeding boar is at least half the herd, it would seem appropriate to commence a discussion of feeding and management methods with this member of the breeding herd and follow through with the sows and growing pigs.

The boar, like the stallion, on many farms is apt to be a neglected animal. In many cases he is confined to a small pen with very high walls, little provision being made for exercise or company which will help in keeping him from becoming bad tempered.

The ideal treatment for a boar during the summer season is the run of a good pasture lot with just sufficient grain to keep him in good vigorous breeding condition. Young growing boars should receive about 1 pound of grain daily to each 100 pounds of live weight when on good pasture and mature boars from ½ to ¾ pounds of grain daily per 100 pounds live weight. The aim should be to not permit the breeding boar to become too fat and still have him in good vigorous condition. If pasture is not available green-feed may be supplied to the boar in his pen.

During the breeding season the boar's feed allowance should be increased, and as palatable feeds as possible fed, as many boars, especially of the bacon type, are apt to go off feed at that time. A mixture of equal parts of oat and barley chop or two parts oats, 1 part barley and 1 part wheat, along with a small allowance of skim-milk, or from 6% to 10% of supplement, should prove satisfactory for the breeding boar.

Young boars should not be used for breeding until they are from 8 to 9 month of age, and not used too extensively during the first season. The young boar should not be used more than once a day and not permitted to serve a sow more than once. It is a mistake to allow a young boar to run with the sows and breed indiscrimin-

ately. Boars in run-down condition are apt to sire small and weakly litters.

When more than one boar is kept it is a good plan to allow the boars to run together between breeding seasons. Mature boars should have their tusks removed before turning together, and the occasion of their meeting should be a cool day. The breeding boars run together regularly at the University Farm and no trouble has been experienced in handling them in this way. In tusking boars a noose of stout rope is passed around the upper jaw and made fast to a post or railing in the pen. The tusks are usually quite exposed, and may readily be removed with a pair of bolt cutters or by the use of a crowbar and cold chisel. The first method is much to be preferred, but if the bolt cutters cannot be procured, the sharp edge of a crowbar may be placed against the base of the tusk and held firmly by one operator while the other strikes with the cold chisel and hammer directly opposite the edge of the crowbar.

Care of the Brood Sow

Having secured the right type of brood sow, much of the year's success in pig raising depends upon how she is fed and handled just prior to breeding and during the pregnancy period. Sows which are bred when in good condition, or at least gaining in weight if they have just weaned a litter, and are well nourished during the pregnancy period, are much more likely to farrow big strong litters than sows which have been thin and run down when bred and poorly cared for before farrowing.

Sows should if possible have the run of a good pasture during the summer months. With good pasture, water and shade, little grain feeding will be necessary, especially with mature sows, unless

Fig. 11.—Brood sows should have access to good pasture during the summer months. The above illustration shows a few of the sows at the University Farm on their summer pasture.

they are quite thin when their litter is weaned. Young growing sows should have grain during the pasture season if they are to be given a chance to develop properly. From ¾ to 1 lb. of grain per 100 lbs. live weight daily along with good pasture will bring the young sow along in good condition. As the time approaches for breeding the sows may be given some extra grain if they do not seem to be in the proper state of thrift.

During the winter months and while the sows are carrying an unborn litter, they should be obliged to take a reasonable amount of exercise and should be fed feeds which supply plenty of protein, the material required for tissue growth, mineral matter required for the growth of a good skeleton in the newly farrowed pigs, as well as such essential vitamins at A and D. Sows which have been fed rations lacking in mineral, particularly lime, are apt to farrow weak pigs and they may fail to milk properly after farrowing. A shortage of vitamins A and D will contribute to weakness and blindness in new-born pigs, as well as lack of resistance to infection during the first few weeks of life.

> The importance of balanced rations for brood sows is indicated by the results of an experiment which has been in progress at the University of Alberta for the past 3½ years. Sows denied access to pasture and fed continuously on a mixture of 98 pounds equal parts oats and barley plus a pound of ground limestone and a pound of iodized salt have weaned an average of only 4.6 pigs per litter as compared to an average of 8.2 for sows fed the same grains supplemented with minerals, feeding oil, protein **and pasture** in season. Due to the added expense involved in providing pasture as well as protein, mineral and vitamin supplements for the sows of the latter group, the cost of maintaining these sows was somewhat more than one and a half times the cost of maintaining the group that weaned only 4.6 pigs per litter. However, the **net return** from the well-fed sows over a 3½ year period has been **four times** that realized from an equal number of sows fed the unbalanced ration.

It is a good plan to arrange to have the sows' shelter at some distance from the place where they are fed so that they may be forced to walk a considerable distance for feed. With regard to shelter, the main requirements are a dry bed and freedom from draughts and overcrowding. Sows are successfully sheltered through the winter on many farms in straw stacks or straw-pole shelters where a framework of poles is constructed and straw blown over the frame. At the University of Alberta brood sows have been successfully wintered for several years in colony houses of such type as

shown on page 65. These colony houses when banked with straw provide good accommodation for from three to four sows, depending upon their age.

Feeds for the Brood Sow

The ordinary farm grown grains, such as oats, barley and wheat, may form the basis for suitable winter rations for brood sows. Such mixtures as the following have been used satisfactorily at the University of Alberta:

Oats 1 part		**Oats 2 parts**
	or	**Barley 1 part**
Barley 1 part		**Wheat 1 part**

Oats are the safest single grain for brood sows, but there is an advantage in adding some wheat or barley to the oats. Barley and wheat alone are too fattening for sows, and may tend to cause weak pigs and a lack of milk at farrowing time.

With mature sows it is not necessary to feed a large amount of supplementary feed apart from alfalfa meal of good quality or even good, well cured alfalfa hay. Alfalfa meal may be mixed with the grain at the rate of from 10% to 20% and if the alfalfa cannot be ground and fed in this way, it may be placed in feed racks or fed on the ground. If alfalfa is not available some other legume hay may be substituted or even green oat sheaves will be helpful. With young sows which will farrow their first litter, such foods as skim-milk or buttermilk or tankage are a great benefit. Our young sows at the University are fed approximately 8% of tankage or 10% of supplement in addition to having access to green, second cut alfalfa hay. If roots are available they can be fed to advantage to the sows. One pound of bran added to the feed daily for two or three

Fig. 12.—Young sows which will farrow their first litter should be well fed during the winter months.

weeks before farrowing will exercise a laxative and cooling influence.

Grains may be fed ground and either slopped or dry. At the the University of Alberta we follow a plan of feeding whole grains at the morning feed, sprinkling it on the frozen ground so that the sows are encouraged to take plenty of exercise in gathering the grain from the ground. The evening feed is fed in the form of slopped, chopped grain.

In order to convey some idea as to the amount of grain required to carry sows through the winter feeding period, and the daily amount necessary to bring sows through the winter in good condition, the following daily allowances are suggested:

Mature sows: .8 to 1 lb. per 100 lbs. live weight during the first 12 weeks—1.2 to 1.3 lbs. last 4 to 6 weeks.
Yearling sows: 1.4 to 1.6 lbs. per 100 lbs. live weight during pregnancy.
Gilts: 1.5 to 1.8 lbs. per 100 lbs. live weight during pregnancy.

In districts where there is any likelihood of hairless pigs being farrowed, in fact under practically all Alberta conditions, the feeding of potassium iodide, or the administration of iodine in some form to the pregnant sows, is strongly to be recommended. Particulars regarding this treatment will be found under "Swine Diseases."

A single mineral mixture such as the one outlined on page 42 should be kept in front of the sows at this stage.

Care at Farrowing Time

Farrowing time is the critical time in the pig business. Heavy losses are apt to occur here unless care is exercised. It is estimated that 30% of the pigs farrowed are lost each year between farrowing and weaning time. A pig which dies at farrowing does not represent a heavy loss, but it means one pig less at marketing time.

The following farrowing time precautions are suggested:

(1) Provide suitable farrowing accommodation for sows farrowing during the winter and early spring months. Some form of artificial heating is highly desirable and may be provided in the form of a "brooder house," a piggery heated by a stove or other suitable means, or electric pig brooders.

(2) Remove the sow from her winter shelter to a suitable farrowing pen at least one week before she is due to farrow. The length of the pregnancy period in the sow is from 112 to 114 days, or 3 months, 3 weeks, 3 days. It generally pays to bring the sow into some pen where she can be supervised at farrowing. The sow which comes out of the straw stack with thirteen pigs is loudly proclaimed, but the sow which comes out alone after farrowing does not get any publicity.

(3) Properly clean and disinfect the farrowing pen before the sow is placed in it, and where worm infestation is suspected in pens that are regularly used for farrowing, it is recommended that the floors be scrubbed with a strong solution of lye in **boiling** water (1 lb. of lye to 40 gallons of water). This destroys the worm eggs and prevents the little pigs becoming infested while in the farrowing pen.

(4) Provide a guard rail around the side of the farrowing pen. This rail, which may constitute a 2″×4″, or a small pole, should be placed approximately 8 inches from the floor and projecting out 6 inches from the wall. This guard rail allows the small pigs to seek protection when the sow lies down, and is a wonderful means of avoiding loss by crushing.

(5) Avoid long coarse straw in the farrowing pen. The newly-born pigs may become either tangled or buried in the long straw, and thus are more likely to be crushed. Cut straw or chaff makes the most suitable bedding for the farrowing pen.

Fig. 13.—Remove the small tusks or "black teeth" as soon as possible after the pigs are born.

(6) In connection with winter and early spring farrowing, especially, the sow should be watched carefully at farrowing time so that help can be given in case of weak pigs or an irritable sow. If the small pigs have become chilled they may be revived by placing them in a box near the stove, or individual pigs may be wrapped in a warm blanket or immersed up to the neck in warm water. When the sow is irritable or clumsy, it is a good plan to remove each pig as it is born and return the complete litter for nursing when farrowing has been completed and the sow is resting quietly.

(7) Remove the small tusks, or "black teeth" as they are commonly called, from the mouths of the small pigs within a few hours after they are born. These sharp teeth irritate the sow's udder and cause cuts and scratches on the faces of the pigs while fighting at nursing time. The job can be done with small nippers made for the purpose.

Feed and Care of Sow and Litter

Beginners are often anxious to feed the sow heavily immediately after farrowing. Nothing is more detrimental to her welfare. She should not be allowed anything but lukewarm water for the first 24 hours after farrowing. Following that, the first feeds given should contain a high percentage of such feeds as bran, shorts and oats. Bran or shorts on hand at this time can be used to advantage. The feed may be gradually increased and heavier feeds added until the sow is on full feed in from a week to ten days.

The most satisfactory ration at this time is one that includes either skim-milk or buttermilk. These feeds naturally tend to stimulate milk flow and preserve the body weight of the sow, and in addition, as the young pigs learn to eat from the mother's trough, they make more rapid growth when skim-milk forms a part of the ration.

An experiment conducted at the University of Alberta during the spring of 1923 indicates how milk during the nursing period saves the body weight of the sow. Sows receiving a mixture of oats, barley and shorts slopped with water lost an average of 1.53 lbs. per day in body weight during an 8-week suckling period and weaned pigs weighing 25 lbs., while sows receiving oats, barley and

Fig. 14.—Yorkshire sow with litter of twelve pigs at the University of Alberta. The nursing sow should be liberally fed to stimulate milk production.

buttermilk only lost .41 lbs. per day and weaned pigs averaging 26 pounds. Weight lost by sows while nursing a litter must be recovered either before they farrow again or go to market, as the case may be, so that feeding to maintain the condition of the sows as well as to stimulate milk flow is a matter of importance.

After the first few days oats, barley and wheat may be used satisfactorily for the nursing sow. We have found the following mixtures satisfactory:

Oats 1 part **Barley 1 part**	**or**	**Oats 1 part** **Wheat 1 part**	**or**	**Oats 2 parts** **Barley 1 part** **Wheat 1 part**

Some may prefer to feed a higher proportion of oats than suggested above, but unless they are much cheaper than wheat and barley, the practice would not be justified.

When skim-milk or buttermilk are not available, the addition of 12 lbs. of supplement to each 100 lbs. of grain is to be recommended.

Care of the Litter Before Weaning

Prevention of Anemia.—When pigs are born during the winter and early spring months and are confined to the piggery, special care must be taken to prevent the development of anemia. This condition may cause serious direct and indirect losses and should be guarded against. For treatment refer to "Swine Diseases," page 92.

Fig. 15.—Grain may be placed in a "creep" in the corner of the pen and the small pigs may help themselves as they please.

Creep Feeding.—The small pigs will begin to eat from the mother's trough when they are around three weeks of age. When they reach this stage it is better to provide them with a separate trough or small self-feeder, as a hungry sow may throw the small

pigs against the edge of the trough or the wall and injure or even kill them. If the pen is large enough, it is a splendid scheme to partition off a corner leaving an opening where the small pigs may go in for feed but where the sow cannot enter. This is most feasible where the sows and litters are running out in large lots, but suitable arrangements may be made even in pens 10′×12′ in size. Grain may be placed in a small trough or self-feeder in such a creep and the small pigs may help themselves as they please. The creep feed troughs illustrated on page 83 have also been found very useful in preparing pigs for the weaning period.

Suitable mixtures for feeding in creeps may be made up as follows:

Hulless oats	73 lbs.	Hulless oats	73 lbs.
Barley	10 "	Barley	10 "
Wheat	10 "	Wheat	10 "
Tankage	3 "	Tankage	5 "
Fish meal	2 "	Ground limestone	1 "
Ground limestone	1 "	Fish oil	1 "
Fish oil	1 "		
	100 lbs.		100 lbs.

The grains should be ground medium finely. If hulless oats are not available, ordinary oats may be used, but it is desirable that the hulls be sifted out as very small pigs cannot digest the coarse hulls, and in addition, the sharp hulls may cause digestive troubles. If skim-milk is available, the tankage and fish meal should be eliminated from the mixtures suggested and the milk may be fed along with the grain mixture.

Commercial "pig starters" may be used to good advantage at this stage, particularly if skim-milk is not available. They contain grains and a variety of supplements in suitable proportions and make up a complete feed. The use of such "starters" cuts down on the amount of labor involved in mixing feeds and avoids the necessity of purchasing and weighing out of small quantities of a number of supplements.

Castration.—Male pigs from all grade sows and male pigs from pure-bred sows which are not good enough to be kept for breeding purposes should be castrated at six weeks of age. Many farmers hesitate to castrate pigs, and prefer to have a neighbor or itinerant handy-man do the job, but the operation can be safely done if a few simple precautions are observed.

Cleanliness, a sharp knife, a fairly generous incision coming well down on the scrotum to permit drainage, and a disinfectant in the wound are the main precautions. For a number of years students have obtained practice in castration of young pigs at the University swine barn, and no casualties have ever occurred.

Ruptured pigs present more of a problem in castration. This trouble is known to be hereditary, although in some cases it may be caused by sows lying on the pigs. Ruptured pigs should be kept off feed for some time before castration. The pig should be held up by the hind legs and the front end held rigidly to prevent a struggle. In making the incision only the skin of the scrotum should be cut, care being taken not to cut the membrane or sac which covers the testicle. The testicle should then be drawn out enclosed in the membrane, and the intestines kept well pushed back. When the testicle has been drawn out far enough, tie a strong string around the cord of the testicle, including the membrane, and then cut away the testicle and surrounding membrane just outside of where the string was tied. The end of the string about three inches long may be left to hang outside the wound. Some prefer to stitch the wound in order to reinforce the well of the membrane holding back the intestines. Plenty of disinfectant should be used at all stages of this operation.

Identification.—Where pure-bred pigs are kept, the pigs must be identified under eight weeks of age. White colored breeds, such as Yorkshires and Chester Whites, must be identified by tattoo marking. This is a regulation of the Canadian Swine Breeders' Association. Breeders are allotted identification letters for their exclusive use. The herd identification letters are tattooed or tagged in one ear and the number of the animal with designating year letter is placed in the other ear. As the pigs must be tagged when quite small, care should be taken to insert the tags well down toward the base of the ear so that permanent drooping of the ear may be avoided. The tattoo and tag methods of identification are official. Another method which may be adopted for private use is the ear

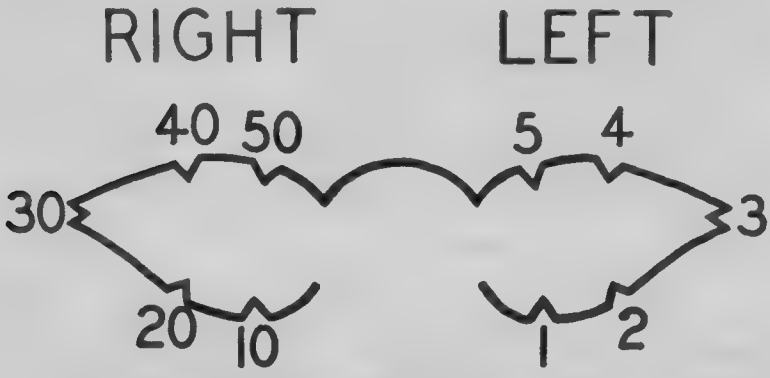


Fig. 16.—System of notching pig's ears for identification purposes. (Reproduced from "Productive Swine Husbandry," by Day.)

notching system in connection with which a "V" shaped notch is cut out of the edge of the ear with an ear notcher. A convenient marking system for up to 100 pigs is shown in Fig. 16.

It will be noted that various combinations may be worked out, using notches in one or both ears. While pig No. 5 will only have one notch in the upper part of the left ear, pig No. 8 will have two notches, one at the upper side and one at the tip of the left ear. Likewise pig No. 32 will have one notch in the tip of the right ear and one in the lower centre of the left ear.

Feeding Pigs After Weaning

If two litters per year are to be raised, pigs should be weaned at eight weeks of age. Some wean pigs at six weeks regardless of conditions, but pigs weaned at this age are handicapped as compared with those weaned later. If only one litter is to be raised by the sow during the year and skim-milk is scarce, there may be some advantage in letting the pigs nurse until they are 10 or 12 weeks old.

Fig. 17.—Litter mate pigs at five months of age. The pig on the left weighed 107 lbs. and the one on the right weighed 197 lbs. Feeding skim-milk made the difference.

The weanling stage is the critical period in the pig's life, and a special effort must be made to carry the young pig over from the mother's milk period of his existence to a point where his digestive organs become accustomed to large amounts of solid food. It must be remembered that whole milk is rich in protein and minerals and contains certain vitamins that are essential for growth and health. **If a sudden change is made to a feed mixture which is very coarse in texture or is seriously lacking in the essentials mentioned, diges-**

tive disturbances are apt to develop, resistance to infection will be lowered and serious losses may follow.

If the pigs have been well acquainted with the feed trough and a good combination of feeds before weaning (preferably by the use of a "creep"), the chance of a weaning set-back developing will be avoided to a large extent.

Protein: The best substitute for the mother's milk is skim-milk or fresh buttermilk and if these are not available some substitute should be provided. A properly blended protein-mineral mixture will serve as a good substitute for milk at this stage.

The supplement may be mixed with the grain at the rate of 6 pounds to 94 pounds of grain for the first week after weaning, increasing gradually up to 12 pounds in 100 pounds of feed mixture and keeping it at this level until the pigs reach a weight of around 110 pounds when it should be reduced again to 6%.

To indicate the advantage of using some form of substitute when milk is not available, the following table is presented. Three groups of pigs were included in an experiment during the winter of 1939-40 and checked through the after-weaning stage, one group getting grain alone, one tankage as a milk substitute, and one skim-milk.

TABLE XIII.—SUPPLEMENTS FOR PIGS AFTER WEANING

	GROUP 1 Grain Alone	GROUP 2 Grain Tankage	GROUP 3 Grain Skim-milk
Number of pigs	8	8	8
Average daily gain during 6 weeks after weaning	.34 lbs.	.67 lbs.	1.01 lbs.

Vitamins: If the pigs are weaned during the late fall, winter or early spring months, and especially if confined to the piggery, it is advisable to feed them some fish oil for at least the first month or six weeks after weaning. This will assist in preventing symptoms of vitamin D deficiency (crippling) and vitamin A deficiency (poor growth, staggering and dizziness) and may help in improving resistance to infection (see page 43).

Mineral: If weanling pigs are receiving plenty of skim-milk, or if supplements are being fed along the lines suggested, it will not be necessary to feed mineral mixtures. Such feeds contain both protein and mineral and the feeding of large amounts of additional mineral will not only prove of no value but may actually prove harmful. There is, of course, no harm in self-feeding some of the simple mineral mixtures at the weanling stage, but the plan of adding minerals direct to the feed, regardless of other supplements being fed, is a dangerous one.

Grain: Farm grown grains have been found satisfactory for weanling pigs, and where good quality oats, barley and wheat are on

hand a suitable feed mixture can be worked out when proper supplemental feeds are provided. A mixture of the grains will give better results than feeding one alone. Young pigs prefer oats to other grains at the weanling stage so this grain may make up a fair proportion of the weaning mixture. Since the small pig cannot handle much bulk, for best results the hulls should be sifted out of the oats or hulless oats fed until the pigs are approximately one month past weaning (see page 55).

If hulless or sifted oats are not available there is a good deal to be said in favor of restricting the proportion of oats in rations for young pigs. In this connection, the results, shown in Table XIV, of an experiment conducted at the University Farm in the spring of 1948 are of interest.

TABLE XIV.—OATS vs. BARLEY FOR PIGS AFTER WEANING

	GROUP 1	GROUP 2
	Oats ..... 70 Barley ..... 15 Supplement 15	Oats ..... 15 Barley ..... 70 Supplement 15
Number of pigs	7	7
Number of days on experiment	51	51
Av. initial weight ..... lbs.	25.7	25.6
Av. final weight ..... lbs.	59	64.3
Av. daily gain ..... lbs.	0.65	0.76
Feed required for 100 lbs. gain ..... lbs.	318.5	306.2

The fiber content of the 'oat' ration fed to Group 1 was 9% as compared to 6.5% for the 'barley' ration of Group 2. As shown in the above table, weanling pigs fed a ration containing 70% barley grew faster and made more economical use of their feed than those fed a ration containing 70% oats.

A suitable grain mixture for pigs after weaning may be selected from the following which have been used successfully at the University:

Oats 1 part **Barley 1 part**	**or**	**Oats 1 part** **Wheat 1 part**	**or**	**Oats 2 parts** **Barley 1 part** **Wheat 1 part**

The proportion of oats, barley and wheat may be altered slightly one way or other without danger. Oats and barley should be ground fairly finely for weanling pigs but wheat should be left in rather a sharp gritty state.

Management After Weaning

In our experience young pigs of the proper bacon type may be hand-fed or self-fed right from weaning time. The system which will be followed may depend upon the factors which were discussed on page 45. A combination system of hand-feeding for the first month after weaning and then self-feeding has been followed very satisfactorily under our system of management at the University

and we are inclined to recommend this method when any large number of pigs is to be raised.

In mixing feed for young pigs, care should be taken to add supplements in the proportions recommended on the basis of experimental work. It is a good plan to check a few mixes by actual weighing of the feeds and then follow these proportions consistently. The addition of supplements greatly in excess of recommendations, sudden changes in mixtures or improper mixing may lead to digestive troubles.

Worm Treatment.—Shortly after weaning, if there is a suspicion that the pigs are suffering from worm infestation, they should be treated as recommended under "Swine Diseases."

Fig. 18.—Spring farrowed pigs make good use of pasture as a supplement to grain during the summer months.

Summer Management

Following the after-weaning period, and probably early in June with the average spring farrowed pig, some form of pasture should be available. Pasture crops and their place in pig raising were discussed on page 40, so we need not again elaborate on their value at this time. We would assert again, however, that under average conditions in Alberta they appear to fill a real need in the pork making scheme.

When milk is not being fed, even though good pasture is available, we would suggest the use of a protein-mineral supplement, at least to the extent of about 6% of the grain ration until the pigs reach a weight of 150 pounds. After this weight the necessity for protein is not as marked, and if a suitable mineral mixture is being fed it may be eliminated.

Oats, barley and wheat may be used in various combinations at this stage, and the following mixtures are suggested:

Oats 1 Barley 2	or	Oats 1 Wheat 2	or	Wheat 1 Oats 2 Barley 1	or	Oats 1 Barley 1 Wheat 1	

Water.—If possible, water should be kept in front of the pigs at all times during the summer. The automatic waterer, when attached to a barrel as shown on page 87 makes provision for a steady water supply.

Shade.—If natural shelter is not available in the form of brush, colony houses work in well for summer shade. Shelter should be convenient to where the pigs feed, or they may spend too much time in the sun and suffer from sunburn or sunscald. This is a serious problem, especially with white pigs, and causes a good deal of worry and loss on many farms. Blistered pigs should be well treated with oil of some kind; mineral oil will be found suitable.

Finishing Feeder Pigs

As a general rule it pays to allow pigs all the grain they will eat during the pasture season. The plan of "growing pigs" on a limited feed of grain and "finishing" them with more liberal grain feeding, may result in a slight saving of grain, but this saving is usually offset by the extra labor cost involved in a longer feeding period, and our experiments of recent years indicate that the quality of the carcass is apt to be lowered by the practice of carrying pigs along during a "growing stage" on a limited grain ration. All things considered, it is a wise plan to finish the pigs as they grow, or in other words, to feed liberally from the time the pigs are weaned until they are ready for market.

Some modification in a feeding plan may be necessary, of course, depending on the type of pig being fed. It is important that the finishing process be regulated so that the pigs are properly finished at weights of from 200 to 215 pounds at the farm. Pigs which are under-finished at these weights are very objectionable as they yield flabby, undesirable carcasses which are apt to be placed in the lower grades. After pigs have reached a weight of from 140 to 150 pounds they should be confined to smaller pens, thus eliminating the exercise which results from feeding in large pasture lots.

If pigs have been self-fed during the growing or "pasture" stage, there is usually some advantage in changing to slop feeding during the finishing period of from 150 to 210 pounds, although where the labor feature suggests the continued use of the self-feeder, very good results will be secured.

Oats, barley, wheat and rye may all be used in working out suitable feed combinations for finishing pigs. Barley is the best finish-

ing feed, and when available it should form a large part of the finishing ration. Wheat has given good results in our finishing tests and can be used with barley or as a substitute for it. Rye is not relished by pigs, but can be utilized when mixed with other grains. In one of our 1923 experiments a mixture of equal parts of oats, barley and rye gave very good results. Oats are a relatively inefficient finishing feed.

In order to indicate the rate of gain which may be expected during the finishing period and at the same time to suggest the advantage in economy and avoiding overfinish which results from marketing pigs at around the 200 pound mark as compared with carrying them to heavier weights, the following table showing the results of an experiment conducted during the fall of 1939 is presented. The pigs in this experiment were confined to pens 10′×12′ in size and were fed a grain mixture of 30 parts ground oats, 40 parts ground barley and 30 parts ground wheat. Skim-milk was fed at the rate of one pound to each one pound of grain fed. Ground limestone and salt were added at the rate of ½ pound of each to 100 pounds of the grain mixture.

TABLE XV.—THE INFLUENCE OF MARKET WEIGHT ON FEED REQUIREMENTS

	LOT I Marketed at 200 lbs.	LOT II Marketed at 225 lbs.
Average initial wt.	139.0 lbs.	136.3 lbs.
Average final wt.	200.0 lbs.	225.7 lbs.
Average daily gain	1.8 lbs.	1.74 lbs.
Feed required for 100 lbs. gain:		
Grain	311.2 lbs.	350.4 lbs.
Skim-milk	311.2 lbs.	350.4 lbs.
Cost of 100 lbs. gain	$2.86	$3.22
Av. depth of fat at shoulder	1.73 in.	2.00 in.
Av. depth of fat at loin	1.28 in.	1.63 in.

It will be seen that while both groups of pigs made very good gains, the pigs which were fed out until they averaged 225 pounds in weight required a larger amount of feed to put on each extra pound of weight. Gains became more expensive after the 200 pound mark was reached. In addition, the pigs marketed at the heavier weights yielded carcasses showing thicker back fat at shoulder and loin.

When pigs are finished in the dry lot, a supplement may be fed at the rate of 6% to good advantage. Grain mixtures suggested for finishing pigs of 150 pounds in weight, are as follows:

Oats 1 part		**Oats 2 parts**		**Oats 1 part**
Barley 3 parts	**or**	**Wheat 3 parts**	**or**	**Wheat 1 part**
				Barley 2 parts

Farm Grown Grain Mixtures

In the preceding discussion various grain mixtures have been suggested for pigs of different ages. By way of review it may be stated that, in our opinion, the Alberta farmer who can grow oats and

barley, or oats and wheat, or oats, barley and wheat, will have feeds that will make him independent so far as grain mixtures are concerned. As has been pointed out, when milk is lacking some substitute should be provided. With the grains his main concern will lie in working out satisfactory proportions as the age and weight of the pigs advance. In order to bring together some of the suggestions already presented, the following plan is offered:

TABLE XVI.—PROPORTION OF FARM GRAINS FOR PIGS OF VARIOUS WEIGHTS

Weight of pig	Lbs. of oats in 100 lbs.	Lbs. barley or wheat in 100 lbs.	Lbs. of supplement in 100 lbs.	Total
Weaning to 60 lbs.	58	30	12	100 lbs.
60 lbs. to 100 lbs.	48	42	10	100 lbs.
100 lbs. to 150 lbs.	38	54	8	100 lbs.
150 lbs. to 200 lbs.	18	76	6	100 lbs.

The Production of Winter Pigs

As was pointed out previously, one of the major pig marketing problems in Western Canada develops out of the uneven distribution of marketings throughout the year. As a general rule more pigs are marketed during the fall and early winter months than during the spring and early summer months, a condition which disturbs the processing end of the business, as well as marketing connections for the finished product. Successful catering to the British market must depend on a steady volume of supply throughout the various months of the year.

The raising of two litters per year instead of only one, by at least a fair percentage of the sows, would tend to equalize the marketings and in addition would lower the cost of production. The cost of carrying a sow for the year is very little greater when she farrows twice than when she farrows only once.

It must be borne in mind, of course, that when sows farrow during the late fall or winter months, better than average farrowing quarters must be available. Provision will have to be made for artificial heating, care must be taken to avoid chilling of the young pigs at time of birth and during the suckling period, and strict precautions will have to be taken to guard against the development of anemia in the young pigs (see page 92). Sudden changes in temperature constitute a hazard in connection with winter farrowing in Alberta and all possible steps must be taken to keep this factor under control.

Pigs farrowed during the late fall or early winter months will cost more to produce but on the basis of the usual price prevailing on an open market they will bring a higher price than those farrowed in the spring and marketed during the fall months. The

higher production cost may be offset by a higher selling price so that some extra investment in shelter and labor can be justified.

Shelter for Winter Pigs

While pigs farrowed during the fall and winter months require adequate housing during the nursing period, they do not require elaborate shelters during the growing and finishing stages. The winter pig, like the brood sow, must have dry, well bedded quarters, which are free from draughts, but these need not necessarily be expensive. Straw shelters have proven satisfactory on many farms as a temporary measure; and at the University of Alberta colony houses have proven very satisfactory for winter pigs. The gable type house shown in Fig. 19 has been used extensively as a shelter for winter pigs.

The 6×8 colony house will accommodate from 8 to 10 pigs comfortably. In locating the colony houses for the winter they should face south and be crated and banked to the eaves with straw (see Fig. 19. A heavy burlap sack hung over the door breaks the wind and provides suitable protection for the doorway.

If a well built permanent piggery is available this may be used not only for fall and winter farrowing, but for housing the pigs during the growing and finishing stages. Such buildings should be insulated and well ventilated to prevent the accumulation of frost on the walls and ceilings during the extremely cold spells. A small stove in such a building will work wonders in preventing frost accumulation and dampness.

During the winter of 1936-37 an experiment was conducted to compare the feeding of fall pigs sheltered in colony houses (as shown in Fig. 19), with others sheltered in the permanent piggery with artificial heat provided. The two groups of pigs were similar in breeding and were fed the same ration with the exception that the pigs which were confined in the piggery were fed cod liver oil at the rate of 1 pound to each 100 pounds of grain and supplement until they weighed 100 pounds.

The results of the experiment are shown in the following table:

TABLE XVII.—METHOD OF HOUSING FALL PIGS

	LOT I	LOT II
	Piggery, Heated with Stove	Colony House
No. of pigs in lot	5	5
No. of days on experiment	112	128
Av. initial weight ....lbs.	43.7	41.9
Av. final weight ....lbs.	212.0	207.0
Av. daily gain ....lbs.	1.50	1.29
Feed required for 100 lbs. gain:		
Grain ....lbs.	327.01	352.78
Supplement ....lbs.	43.44	47.87
Total ....lbs.	370.45	400.65
Cost of 100 lbs. gain	$5.93	$6.42
Profit per pig over feed cost ($8.00 per cwt.)	$4.45	$3.45

It is to be noted that the pigs fed in the piggery where some heat was provided made their gains more quickly and at a lower cost for feed. The piggery which was heated with a small stove accommodates approximately 70 pigs. Based on the number of pigs which the building accommodates, rather than on the 5 pigs actually on test, the saving in feed amounted to approximately $50.00. It required 3 tons of coal at $4.00 per ton to heat the building, so that the use of the stove was amply justified on the basis of feed saved. At the same time, the pigs fed in the colony houses made very satisfactory and economical gains and returned a fair profit over feed cost considering 1936-37 grain prices. It would seem that while

Fig. 19.—Gable type colony houses banked to the eaves with straw and with a heavy sack hung over the doorway, provide good shelter for fall pigs.

the permanent piggery may have some advantage over the colony house as a shelter for fall pigs, the colony house, with outdoor quarters, will render good service.

Suitable Rations for Winter Pigs

In planning feed mixtures for winter pigs it is well to keep the following general principles in mind: (1) The pig fed during the winter months cannot make use of pasture or green-feed in the same sense as the pig farrowed during the spring or summer months and, therefore, cannot help to balance his own rations; (2) gains should be such that most of the pigs may be marketed at between six and seven months of age.

Unless the ration of the winter pigs is well balanced, gains are likely to be slow and comparatively expensive. Pigs badly fed during the winter months can "pile up a heavy feed bill" and prove a liability rather than an asset.

Grain Mixtures

With regard to grain mixtures for winter pigs, what has been said already concerning the use of farm grown grains and the most suitable proportioning of these grains will apply equally well here.

Supplementary Feeds

When skim-milk or buttermilk are to be had, success in winter pig raising is almost assured. When such feeds are not available, we are quite sure from our experimental findings that some substitute must be provided if satisfactory results are to be secured. The spring pig handled on the outdoor plan may get pasture but the winter pig is deprived of this source of additional protein. Here, again, supplements in the proportions mentioned on page 63 will prove of great value when added to the grains. They will insure quick gains and each pound of the supplement will save sufficient grain to more than justify the purchase price.

Mineral Matter for Winter Pigs

The pig grown during the summer months may supplement the grain fed by using pasture, or even by "rooting" up the pasture lot. The winter raised pig is for the most part grown under conditions which deprive him of the use of forage and contact with the soil. For this reason the question of a mineral supply is of even greater importance in the case of the fall and winter farrowed pig than with the spring pig. Mineral supplements work hand in hand with protein supplements in rounding out complete rations for winter fed pigs.

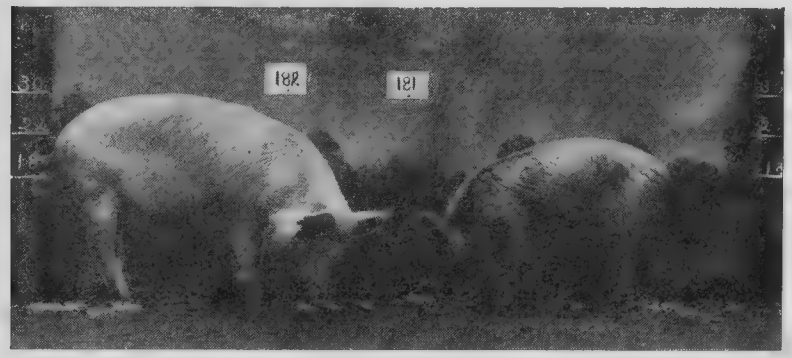


Fig. 20.—Litter mate fall pigs at six months of age. The pig on the left weighed 230 lbs. and the pig on the right weighed 80 lbs. Providing sufficient mineral in the feed made the difference.

Fish Oils

Pigs which are farrowed during the fall and winter months, if closely penned following weaning, will be benefited by the feeding of some form of fish oil until they reach a weight of around 100 pounds. The oil will assist in preventing crippling and our observations with experimental pigs led to the conclusion that this supplement assists in guarding against influenza conditions (see page 43). When commercial supplements which contain fish oil are being fed, it will not be necessary to feed additional oil.

Watering Winter Pigs

When skim-milk or buttermilk is not abundant, and when the grain is fed dry from self-feeders, winter pigs will use a considerable volume of water. If possible it should be supplied three times daily and the trough kept as free as possible from freezing. It is doubtful if the expense of warming the water is justified. In an experiment conducted at the University of Alberta during the winter of 1923-24, the warming of the water did not effect any improvement. Under certain conditions, however, it would appear to be advisable to remove the chill from the water for very young pigs, particularly when the weather is extremely cold.

Winter Pigs Pay Their Way

During the period from 1922 to 1947 approximately 4,500 pigs have been farrowed during the fall months, and grown and finished during the winter months, at the University of Alberta. The majority of these pigs have been used in experiments regarding the feeding and management of pigs finished during the winter months, and in addition the economics of the business have been carefully checked. Over this period, pigs grown out during the winter and marketed during the spring months have returned a satisfactory profit over and above feed costs, even after grain prices were charged at 20% higher than elevator prices. The margin between cost of production and selling price has varied year by year depending upon the relationship between hog and grain prices, but over a period of years the second litter has proven profitable.

It has been demonstrated clearly in our winter experiments, however, that the feeding of protein and mineral supplements is a necessity if economical gains are to be made. The large number of inquiries which we receive each year during the late winter months, regarding slow gains and "crippling" among winter pigs, indicate that more attention must be paid to better balanced rations.

APPENDIX A

EQUIPMENT FOR SWINE RAISING

BY

J. MACGREGOR SMITH, Professor of Agricultural Engineering.

The section of this publication which follows is included to draw attention to plans of certain pieces of swine raising equipment. It also covers plans of hog houses.

Danish Type Piggeries

Since the first edition of this bulletin was published there has been a good deal of interest in the Danish type of piggery which has a dunging alley. The Alberta Department of Agriculture, co-operating with the University Departments of Animal Husbandy and Agricultural Engineering, has prepared plans (pages 71-74) from a piggery built at Spruce Grove. These plans are available on separate sheets, but for convenience have been reduced in size to fit this publication. Copies of these plans on a larger scale may be obtained upon request, from the Extension Service, Department of Agriculture, Edmonton, or the Department of Animal Science, University of Alberta, Edmonton.

The importance of ventilation has been emphasized and the main points to be carefully considered will be found below.

The idea in presenting these plans is not to suggest that each one must necessarily be followed exactly as illustrated, although they are drawn from models which have proven to be satisfactory, but should be used more as a guide to the general type of construction. They may be modified to meet the needs of the individual farm, depending upon the scale of operations. Most of the plans submitted are drawn from equipment which is in common use on the University Farm.

Ventilation

The problems of ventilation are easily taken care of in the first buildings, which are generally erected on the farm. Log stables, straw sheds and sod barns are usually constructed so that the air circulates quite freely through them. However, when more permanent buildings are erected some provision must be made for proper ventilation if they are to provide comfortable quarters for livestock. A well constructed building with no provision for admitting fresh air in small quantities and for taking off the warm foul air in large quantities will result in a damp stable. The walls will be wet or covered with frost; harness and fork handles as well as the stock will be wet.

It is hardly necessary to point out that the climate of Western Canada creates some difficult problems in ventilation. The system shown in the plans is the single out-take King system. Professor L. G. Heimpel of Macdonald College did some research work on this problem and found that the single outlet was quite adequate. On receipt of his bulletin the writer discussed the problem of ventilating a new piggery being erected by J. H. McLaughlin at Spruce Grove, and it was decided to install the system. Careful records were kept on inside and outside temperatures for two winters (1935-36 and 1936-37). The results were very satisfactory. The barn was dry inside and the pigs were comfortable. The barn was planned on the Danish system and in sub-zero weather a stove was used. It is recommended that some artificial heat be provided in extremely cold weather because pigs do not create much heat and they are more susceptible to ailments resulting from draughts and dampness than are other classes of livestock.

It may be well at this time to point out that **unless the barn is to be well built, with the walls (6″ studding) insulated and with all windows provided with storm sash and doors with storm doors,** there is little use spending any money installing a ventilation system.

Dry, coarse planer shavings make good insulating material. Hydrated lime may be dry mixed with them to prevent rodents working. Two pounds of lime to every hundred pounds of shavings. There are also other insulating materials sold commercially.

The ingoing air enters the barn as shown in the side elevation and wall section views. A partition is placed between two studs, the inside part being insulated. It will be seen that the fresh air is directed upwards and through a small hinged door, which will allow a little air to enter even when in the closed position. In connection with the construction of inlet flues it is to be noted that the space between two studs is divided as shown in "Wall section through air intake." It is insulated on the inside. It is important that the cover on the opening at the ceiling be made so that there is, even when it is in the closed position, a space of about an inch.

The outlet flue rises from the floor and if one does not feel that it has to come out on the ridge of the roof it is recommended that it be carried **straight up through the roof.** In either case it must rise above the ridge. In a piggery built by P. J. Rock of Morrin the ventilator was installed quite near the end of the barn (on the inside) away from the stove, and the system was very satisfactory. The outlet flue must be built so that there is no leakage of air. There must be either two ply of lumber with paper between, or insulated board. The flue rests on the ground and if possible should

be vertical from the bottom to the top. Construction is simplified and it will operate to better advantage.

The "detail of the ventilator" shows one type of construction where panels of matched lumber are constructed on the ground and after one is erected, plumbed and braced, the others are put in place. (Horizontal joints should be staggered.) Cross cleats and corner strips hold them together. Insulating board can then be fastened on the corner boards, thus leaving an air space. In another type of construction corner posts are set up, plumbed and braced, and the sides enclosed with horizontal boarding, then paper and V-joint lumber vertically. The door at the floor level is provided with a counterweight which can be easily adjusted. The amount that this door is open controls the amount of air entering the barn. No system can work efficiently without careful attention by the man in charge of the building. The top of the outlet flue should have no louver boards to obstruct the outgoing air. A heat door in the flue at the ceiling will be useful in mild weather.

It may seem to many that there are too many details to be considered, but it was pointed out in the beginning there is no possibility of reasonable success unless the building is carefully constructed. A single ply lumber building, unlined and with the ceiling unlined cannot be ventilated, and there is little use wasting time in trying to find a way to do it. In a moderate climate, windows may swing in from the bottom and no difficulty is encountered in ventilating the building.

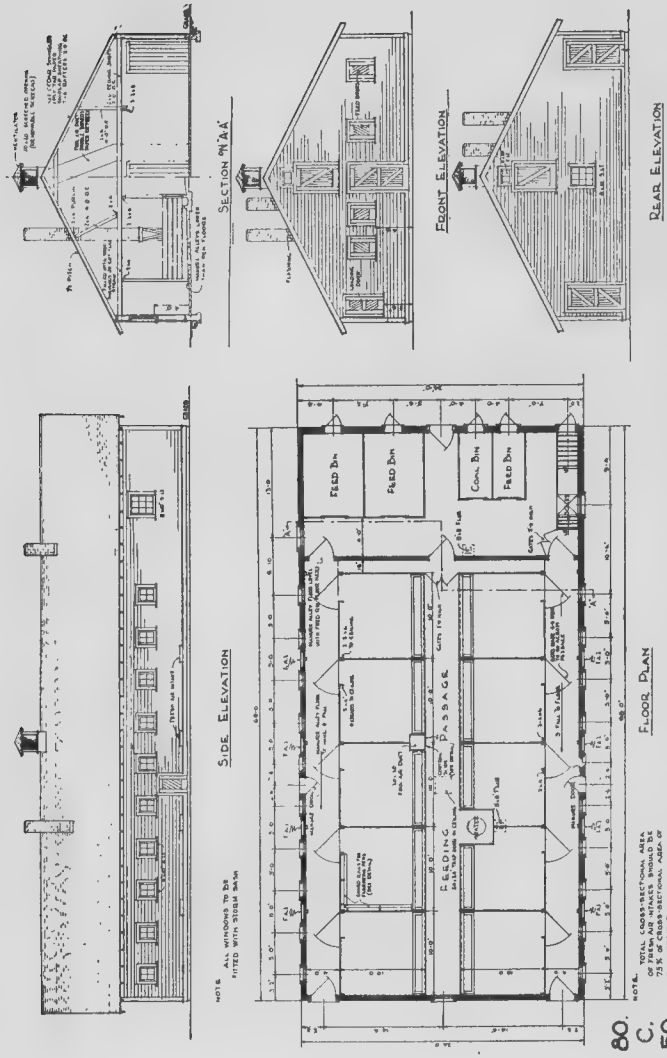


Fig. 21—Plan for ten pen permanent piggery based on the Danish arrangement with litter alley separate from pens.

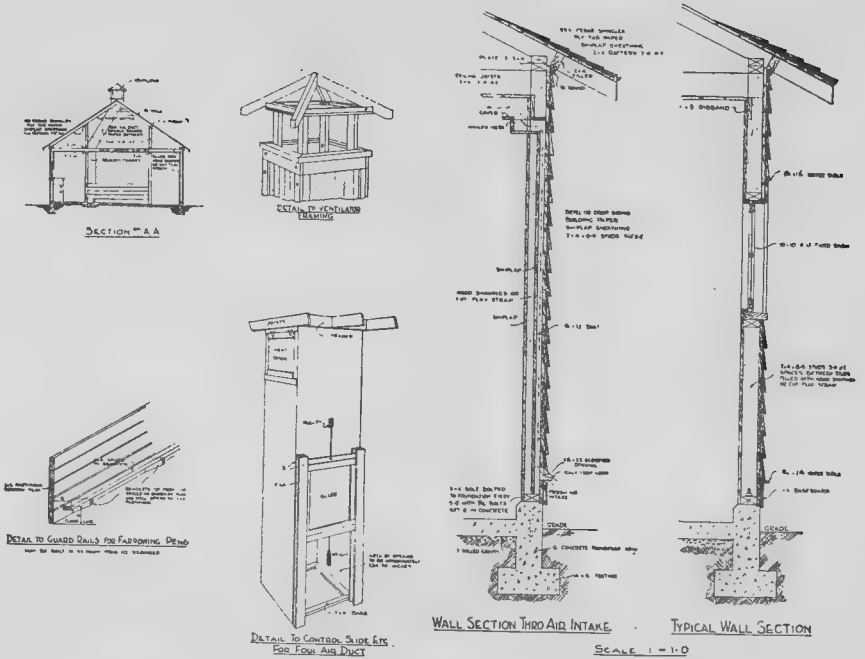
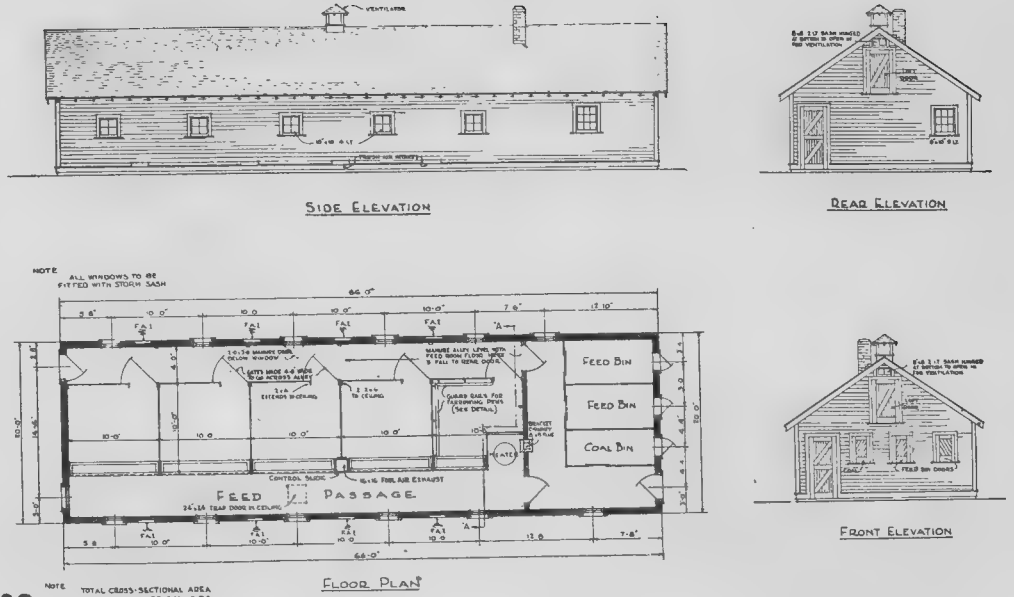

SECTION on A A
DETAIL TO VENTILATOR FRAMING
DETAIL TO GUARD RAILS FOR FARROWING PENS
DETAIL TO CONTROL SLIDE ETC FOR FOUL AIR DUCT
WALL SECTION THRO AIR INTAKE
TYPICAL WALL SECTION
SCALE 1 - 1-0

Fig. 22.—Details of wall construction showing fresh air inlets together with detail of ventilator framing. This system of ventilation to be used in buildings shown on Figs. 21, 23 and 24.



80.
C.
61.

Fig. 23.—Plan for five pen permanent piggery with Danish floor arrangement.

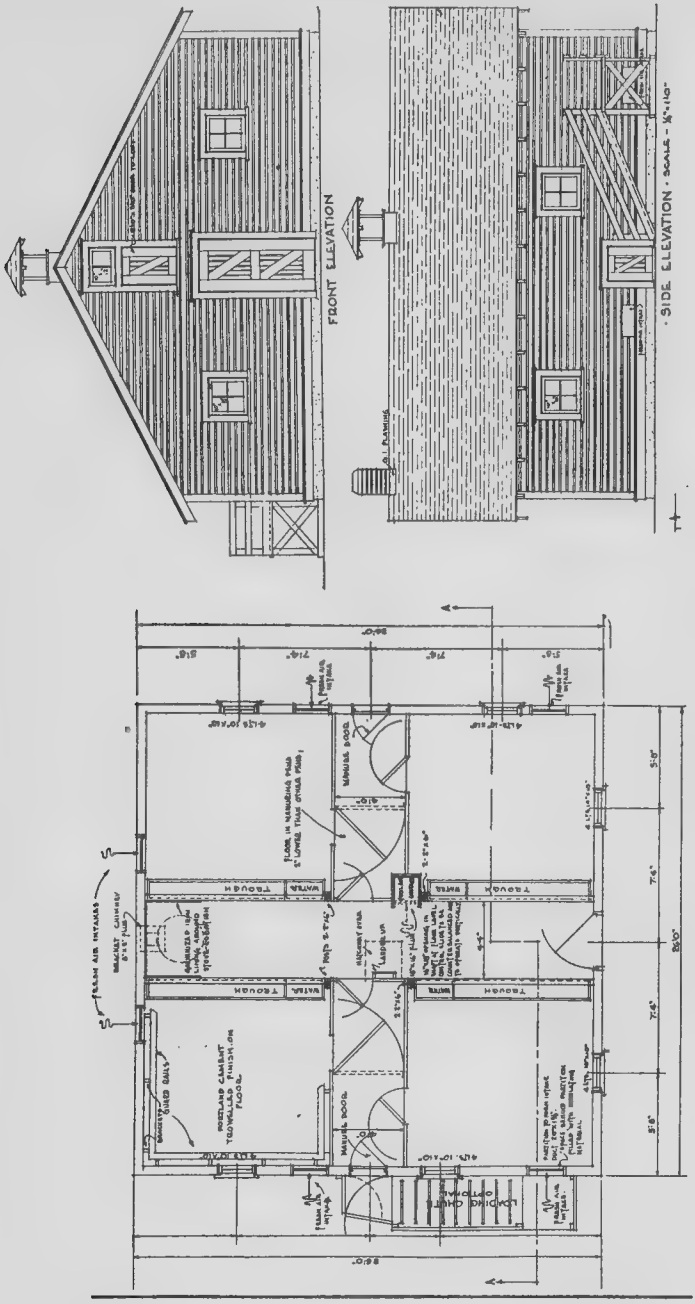


Fig. 24.—Plan for four pen farrowing house or general piggery.

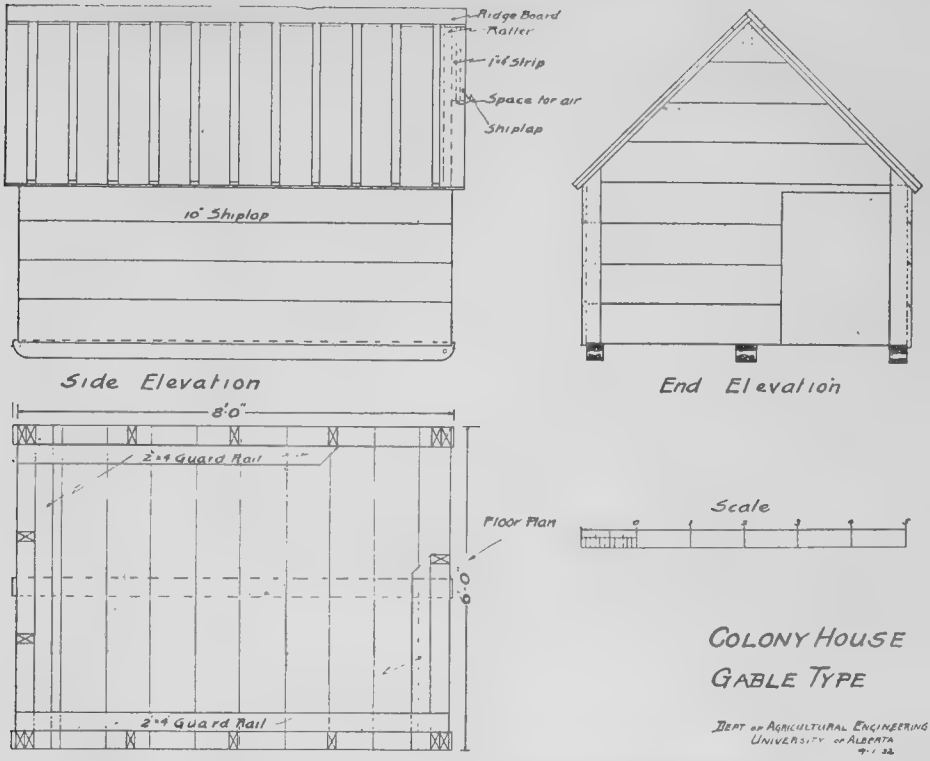


Fig. 25.—Plans for construction of 6′×8′ Gable Type Colony House.

Gable Type Colony House

Several types of colony houses have been used on the University Farm, but the gable type house shown in Fig. 25 has been found the most satisfactory. This house, either 6′×8′ or 8′×10′, can be used practically all the year round. Sows and litters can be accommodated in such houses in the spring after having been removed from the farrowing house, pigs on pasture may be sheltered in them, and when banked with straw they will accommodate fall pigs and brood sows during the winter months. Being portable, they may be moved to fresh ground from time to time and thus assist in avoiding parasitic infestation.

The house shown in Fig. 25 is mounted on 3-4″×4″ runners on which the floor is laid, and the framing being erected as shown in the illustration of framing details. Very little further explanation is needed. The second illustration shows the side and end elevation as well as the plan.

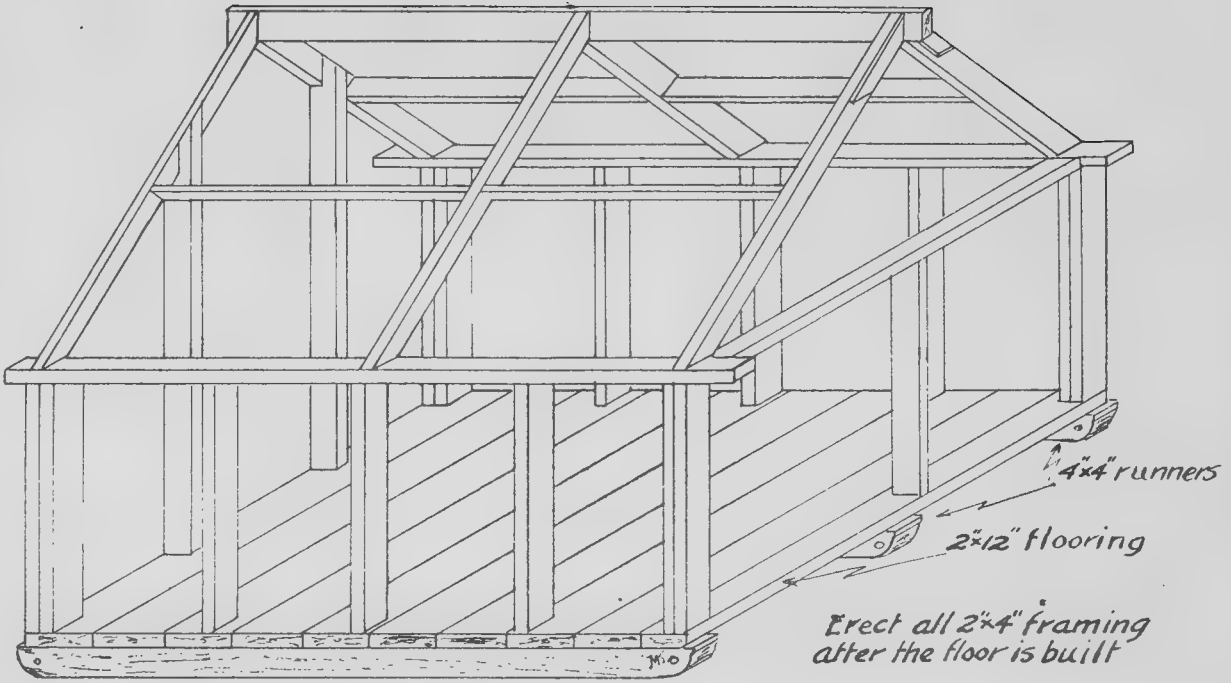


Fig. 26.—Framing details for 6′×8′ Gable Type Colony House.

Pig Brooder House

In an effort to assist swine raisers who wish to have sows farrow during the winter months and who desire special farrowing quarters, a pig brooder house has been designed by the Dominion Department of Agriculture officials working in co-operation with practical Alberta pig producers.

This brooder house, which has been used with satisfaction by a large number of farmers, is a six-sided building with six farrowing pens which taper to the centre. A chick brooder stove is located at the centre and provision is made for the small pigs to have access to the heat from this stove and at the same time secure protection from trampling or damage in other ways.

Information regarding the construction of this building may be secured through the Dominion and Provincial Departments of Agriculture.

Electric Pig Brooder

On farms where electric power is available very good results may be secured from the use of an electric pig brooder, similar to that shown in Fig. 27. Brooders of this type are built into the farrowing pens at the University Farm, and while they are of course most useful in preventing losses from chilling in cold weather, it has been found that little pigs gather in the brooder to sleep even on relatively warm days.

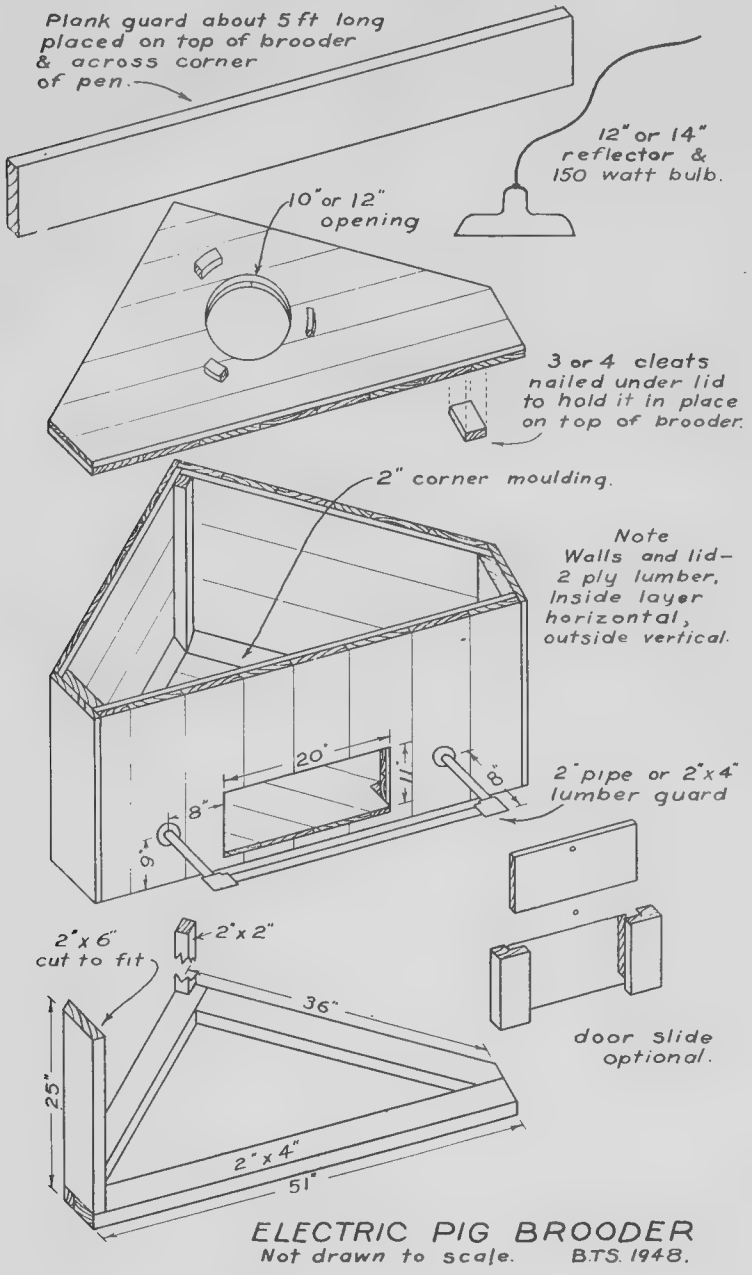

Plank guard about 5 ft long placed on top of brooder & across corner of pen.
12" or 14" reflector & 150 watt bulb.
10" or 12" opening
3 or 4 cleats nailed under lid to hold it in place on top of brooder.
2" corner moulding.
Note Walls and lid— 2 ply lumber, Inside layer horizontal, outside vertical.
20"
8"
8"
9"
2" pipe or 2"x4" lumber guard
2"x6" cut to fit
2"x2"
36"
25"
2"x4"
51"
door slide optional.
ELECTRIC PIG BROODER
Not drawn to scale. B.T.S. 1948.

Fig. 27.—Electric Pig Brooder.

Self-Feeder for Grain

The self-feeder shown in Fig. 28 is a one-way type, that is, the pigs feed from one side only. This feeder is large enough to accommodate from ten to twelve pigs. It might be extended to accommodate a large number of pigs, and modified so that pigs could feed from both sides.

Attention is drawn to the depth of the feed trough and to the spacing strips across the trough. These strips serve to prevent the pigs from rooting the grain out of the trough. A feeder built according to the plan suggested, and when mounted on a platform, will function with a minimum wastage of grain.

In order to make the details of construction clear, a separate cut has been made showing the framing (see Fig. 29).

The galvanized steel sheet which is shown in the sectional view is very important, and makes a good smooth surface for the grain. The construction of the roof and hinges is very important in order to prevent any leakage of water. It is cheap and easily built; a strip of prepared roofing is nailed on to the shiplap and held by strips of lath. Over the hinge another piece of prepared roofing is nailed, making a watertight joint.

Other types of self-feeders for grain are illustrated in Figs. 31-33. Full information regarding construction of these feeders may be obtained from the Provincial Department of Agriculture.

Self-Feeder for Minerals

When mineral mixtures are being fed it is advisable that they be fed from a self-feeder such as shown in Fig. 30. This feeder is shown in actual use in the illustration on page 88.

This feeder is smaller than the one for grain, and it is open on both sides. The adjustable sides do not need to be removed very often, and for that reason no special fastener is required. The two nails will hold them in place quite readily. The lid can be made in the same way as the one shown in the self-feeder, with an extra piece of roofing material over the hinges.

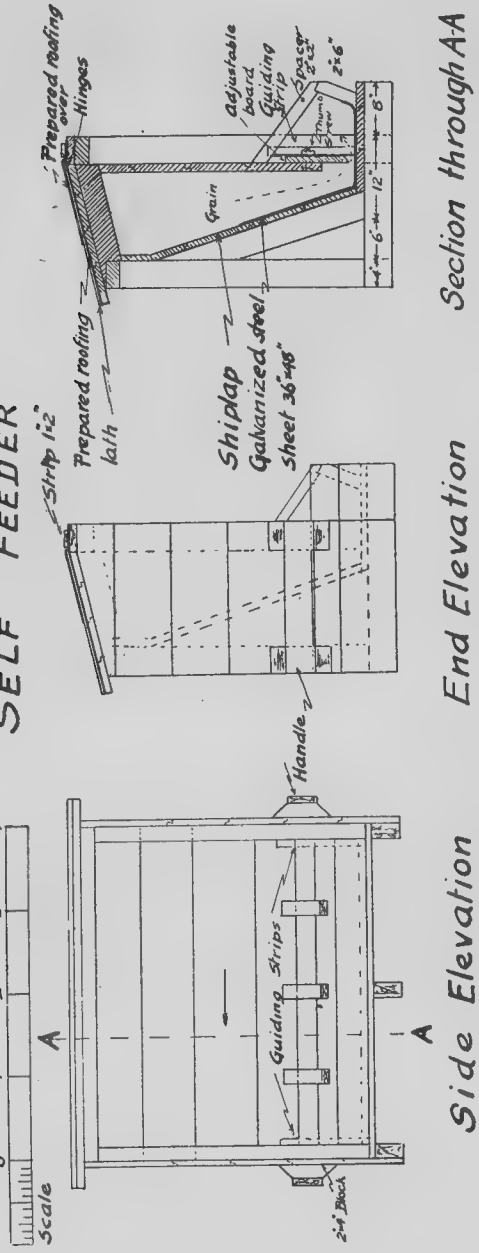


Fig. 28.—Plan for one-way self-feeder for grain.

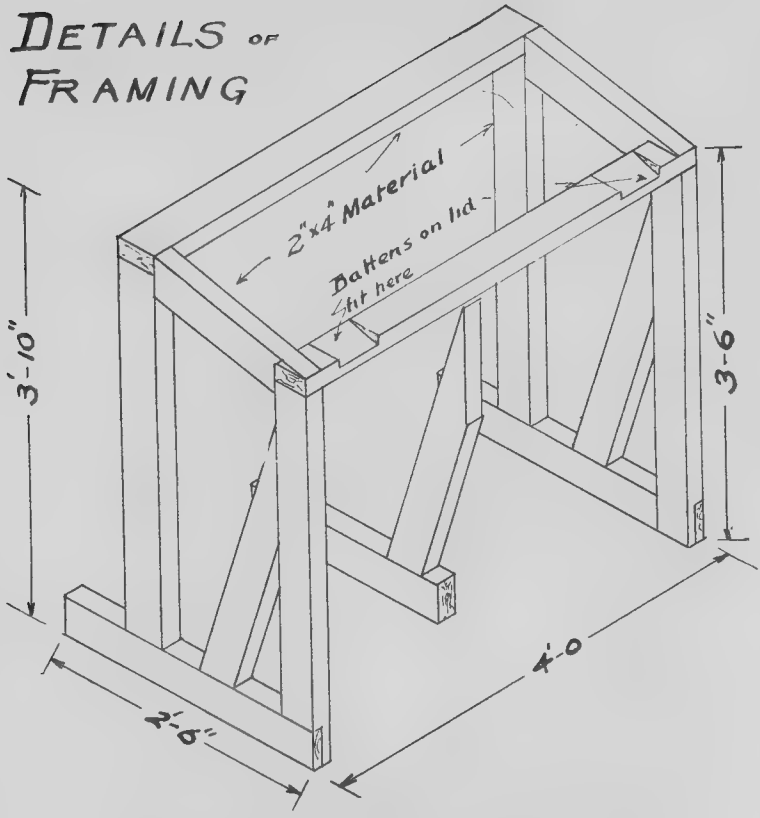


Fig. 29.—Details of framing of self-feeder for grain.

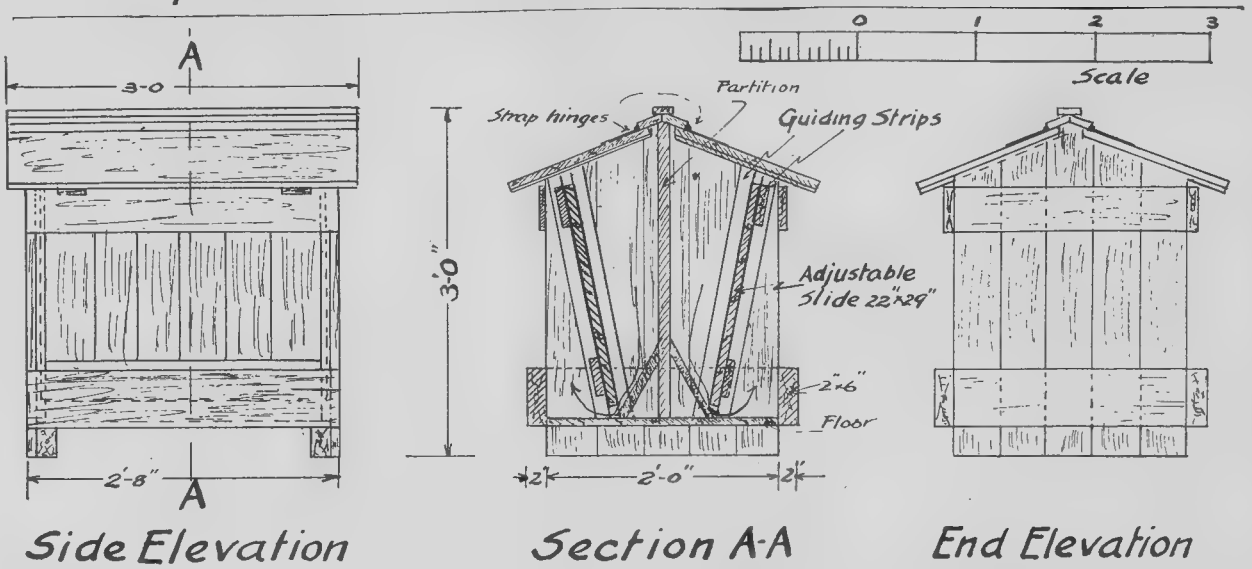


Fig. 30.—Plan for construction of small self-feeder for minerals for pigs.

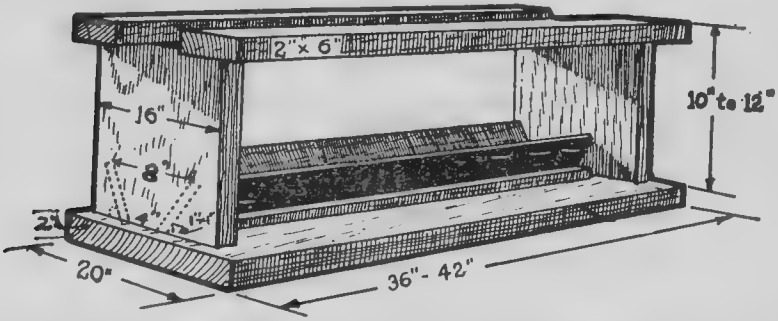


Fig. 31.—Creep feeder for suckling pigs. This trough may be nailed to the floor or built into a partition between two pens so little pigs can feed from each pen. Plan No. H-6 supplied through the courtesy of the Provincial Department of Agriculture.

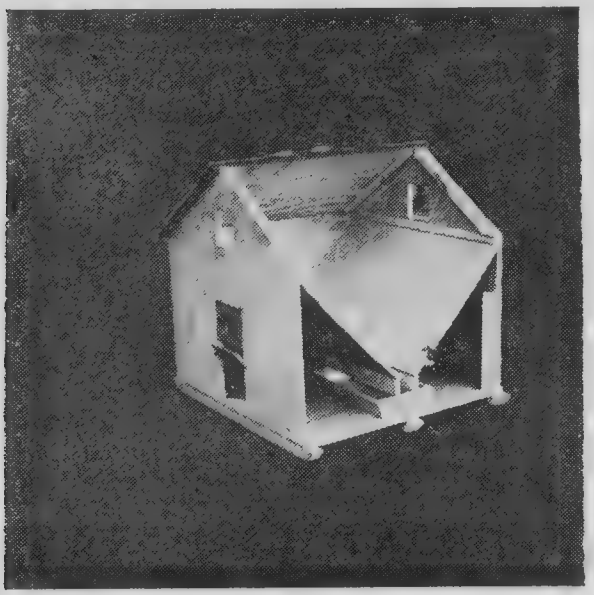


Fig. 32.—Inside self-feeder for hogs, converted from an old granary. Details of construction (Plan No. 11) may be obtained from the Department of Agriculture.

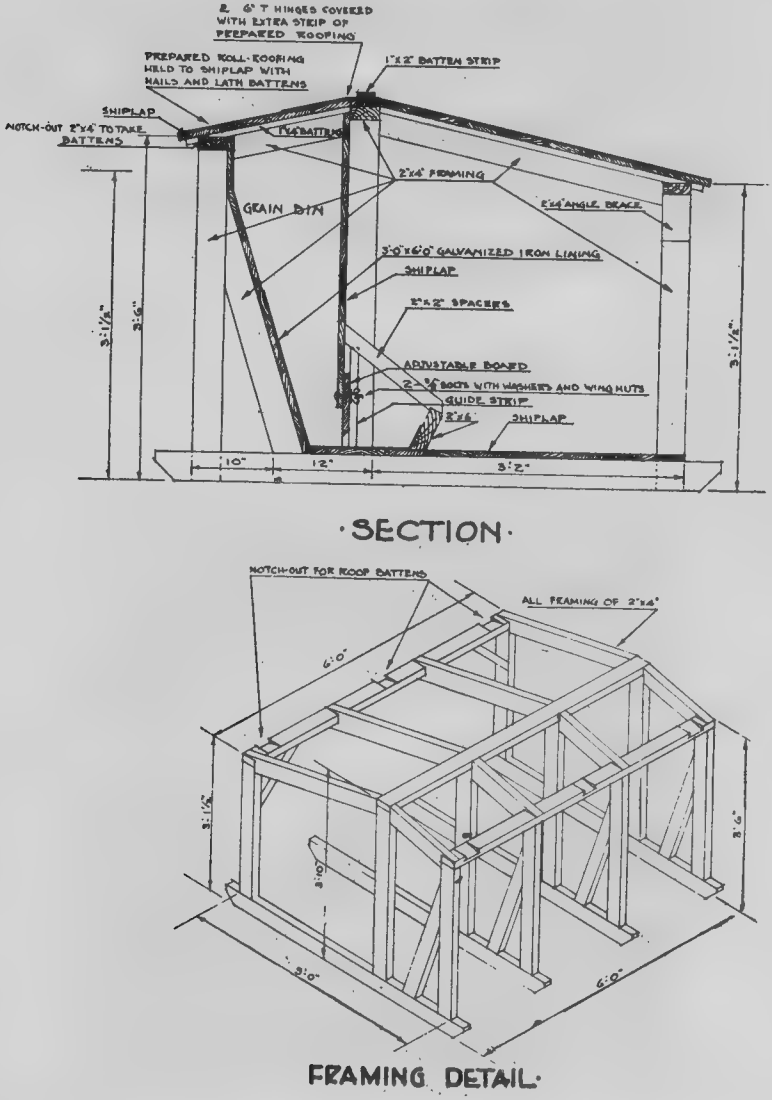


Fig. 33.—Improved one-way self-feeder for grain. A detailed plan (No. 80-C-72) of this feeder may be obtained from the Provincial Department of Agriculture.

Fig. 34.—Plan showing construction of hog shipping crate.

Hog Shipping Crate

Breeders of pure-bred pigs will have occasion to ship pigs to purchasers. Pigs must always be crated, and shipping companies will not accept pigs for shipment unless the crate is well made.

The crate shown in Fig. 34 can be made to suit the size of the pig. The illustration shows a crate that is strongly constructed and will stand shipping well. It will be noticed that most of the boards are 1″×4″ material, with the exception of the two lower boards on the sides and the door and top. The runners are made of 2″×2″.

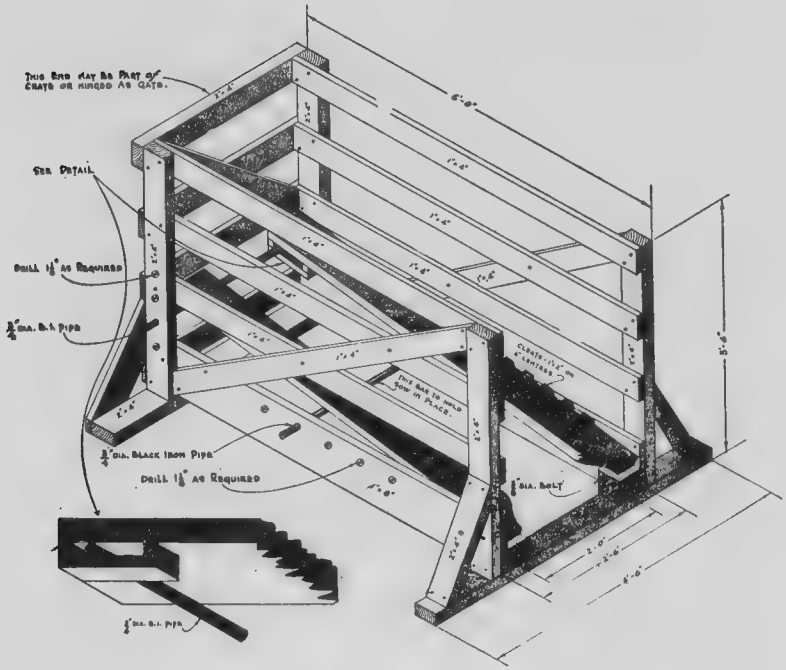

THIS END MAY BE PART OF CRATE OR HINGED AS GATE.
SEE DETAIL
DRILL 1⅛" AS REQUIRED
¾" DIA. B.I. PIPE
¾" DIA. BLACK IRON PIPE
DRILL 1⅛" AS REQUIRED
⅝" DIA. BOLT
¾" DIA. B.I. PIPE

Fig. 35.—Breeding crate.

Hog Breeding Crate

It occasionally happens that a small sow must be mated to a large, mature boar. If the sow is not sufficiently developed to support the weight of the boar, the breeding crate shown in Fig. 35 may be utilized to good advantage. As is illustrated in the above plan, supplied through the courtesy of the Provincial Department of Agriculture, the supports for the feet of the boar may be raised or lowered by adjusting the level of the ¾" iron bar at the front of the crate. The other iron rod which slips through holes in the bottom side boards should come just above the hocks of the sow so that she is prevented from backing out of the crate.

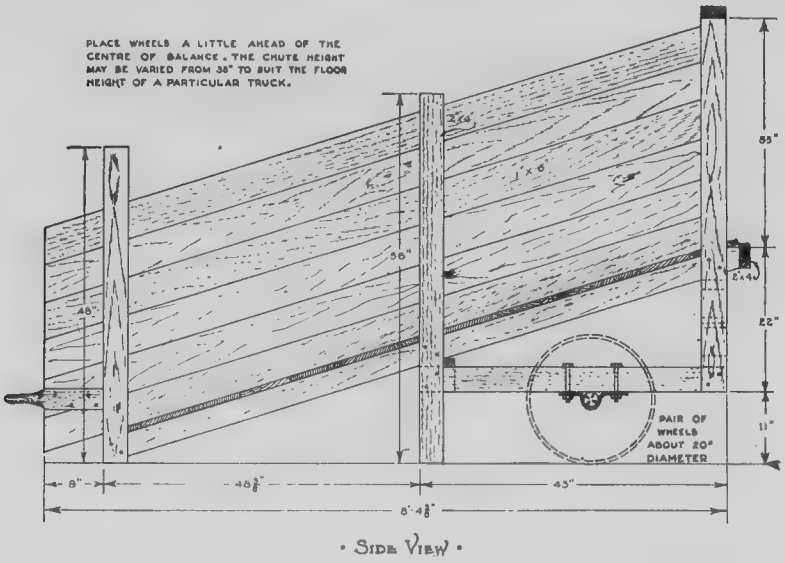


Fig. 36.—Portable loading chute, Plan No. H-3, Provincial Department of Agriculture. When connected with a narrow runway, this piece of equipment makes the job of loading pigs an easy one.

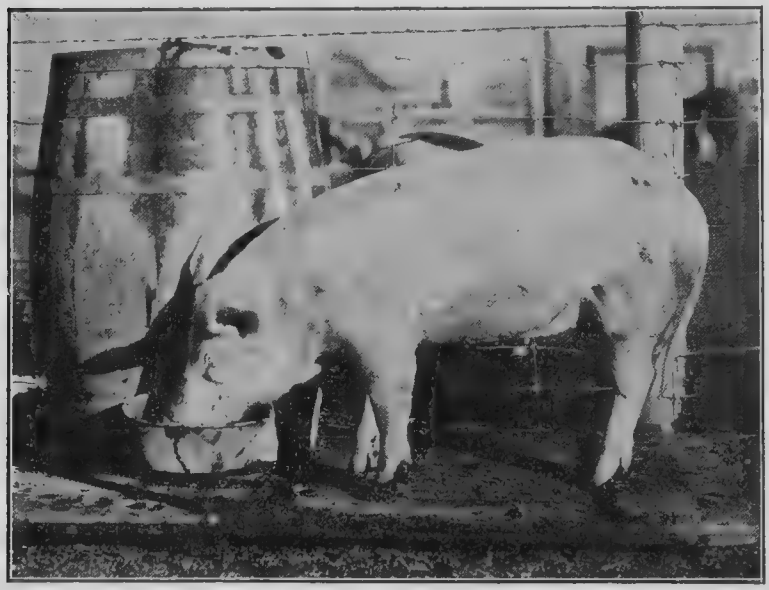


Fig. 37.—An automatic waterer attached to heavy barrel provides a means of keeping water in front of the pigs during the summer months.

Fig. 38.—The water tank with automatic waterers attached as shown above, may be used to keep water in front of a very large number of pigs during the summer months. At the University Farm a herd of thirty sows drink from this tank.

Fig. 39.—The self-feeder for minerals planned in Fig. 30 is shown in actual use in the illustration above.

Hog Weighing Equipment

The use of some type of scale for weighing hogs as they approach a marketable stage, is almost a necessity if they are to reach market at the correct weights. This matter has been given careful consideration by both Federal and Provincial Governments and types of equipment for weighing hogs on the farm have been designed. Plans for a home-made hog weigher may be obtained from the Extension Service, Alberta Department of Agriculture, Edmonton.

A simple, inexpensive scale specially designed for weighing hogs on the farm, may be purchased through the Dominion Department of Agriculture. Information regarding this scale may be obtained from the District Fieldman, Livestock Production Services, Dominion Department of Agriculture, Edmonton.

APPENDIX B

SWINE DISEASES

BY

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In any discussion of swine diseases it is well to remember that the essence of profitable swine production is the raising of large healthy litters, vigorous growing hogs, showing rapid economical gains and which finish into a good quality, market hog. The occurrence of disease at any point in the program can result in serious and even disastrous losses. Animals either die or are left stunted and unthrifty. They never will show satisfactory finish despite ample feeding. Such animals are a definite liability and never will pay for the feed and labour involved.

Fortunately for the swine producer, most of the diseases of swine are preventable, or at least the severity of an outbreak can be greatly lessened by careful adherence to the principles of good swine husbandry, proper feeding and sanitation. A healthy animal is the best insurance available against disease losses. It is a disease resistant animal. The correct definition of a healthy animal would be one that is receiving a complete ration, supplying the full complement of vitamins and minerals, and maintained in clean sanitary surroundings, under conditions which do not tend to weaken the disease resistance of the animal.

Sanitation and Disease Control

Sanitation is of prime importance in the control and prevention of swine diseases. In the study of the spread of disease and internal parasites we find that the most common means of dissemination are by contaminated litter, soil and feeding utensils. A diseased animal may be constantly spreading the disease germs in manure, urine or nasal discharges. Pigs allowed to run in the same pastures and yards year after year are living with an accumulated surplus of disease germs and parasites. The same applies with equal force to dirty pens and barns.

Considering this, the necessity of hog yards and pens that are easily cleaned, feed troughs and drinking utensils protected from contamination, and rotation of pastures can be readily understood. Clean ground for clean pigs is a worth while axiom. When disease does occur, segregation of sick animals, plus cleaning and disinfection of premises is the only logical procedure to be followed.

Veterinary Facilities

A Veterinary Laboratory is maintained in Edmonton by the Alberta Department of Agriculture as a public service. Its facilities are available to all livestock producers in the Province, free of charge. When animals are sick or dying a specimen should be submitted to the Laboratory for examination. It is important that animals should arrive at the Laboratory as soon after death as possible. A live sick animal is preferable. If dead, the carcass should be packed in ice and sawdust, and addressed to the Alberta Veterinary Laboratory, Department of Agriculture, Edmonton, Alberta.

Care of the Pregnant Sow

Strong, healthy, vigorous litters are to a large extent dependent upon the care and feeding of the pregnant sow. Besides the requirement for her own maintenance, there is the need of the developing unborn piglets. When one considers the development of eight or more little pigs in a little less than four months it is easy to understand how a shortage of the necessary vitamins and minerals in the ration of the pregnant animal is reflected in the newborn. Less difficulty is experienced with animals farrowing in summer months when there is an abundant supply of green foods, clovers and alfalfa. In the winter months the food requirements are not so easily met, and it is necessary to supplement the ration.

The proper feeding and management of pregnant sows is adequately described in another section of this Bulletin. However, a short description of the disease conditions which may arise from improper feeding are worth mentioning.

Vitamins A, B and D and the minerals Calcium and Phosphorus are essentials in the diet of a pregnant sow. Vitamin A is often referred to as the anti-infection vitamin. It is necessary in the maintenance of the tissue which lines the digestive and respiratory tracts. It is now believed that a deficiency of vitamin A is responsible for litters which are born dead or are lacking in the necessary vigor and vitality for development into good growing hogs. Diarrhoea observed in suckling pigs may also be the result of a lack of this important vitamin. Ordinarily it is found in fresh green foods, wheat bran and in properly cured clover and alfalfa hay. It is probably best, especially in winter months, to supply it in the form of a good quality feeding or cod liver oil. Two teaspoonfuls a day of an oil containing 1,000 units of vitamin A per gram is sufficient. Cod liver oil is fed to sows on many Alberta farms. As a result the litters have been more vigorous and healthy.

Vitamin D or the sunshine vitamin is required for the development of strong healthy bones and tissues. Good bone formation is

also dependent upon adequate supplies of calcium and phosphorus. In pregnancy there is a terrific demand for these minerals, both for the normal maintenance of the sow, as well as the requirements of the developing little pigs. Lack of vitamin D and minerals can result in rickets, crippling of young pigs after weaning, and weakness or paralysis of the hindquarters of sows.

There is no doubt but that the care and feeding of the pregnant sow is the foundation upon which rests, to a large degree, the successful raising of healthy disease resistant swine.

Hairless Pigs—Goitre

The thyroid gland of any animal is necessary to maintain life, and its function is dependent upon a supply of iodine. The amount of iodine required is very small and in districts where iodine is present in the soil animals receive sufficient amounts of it in their natural food. However, in localities where there is a lack of iodine in the soil, iodine must be supplied, or goitre or iodine deficiency will result. In these areas the thyroid gland fails to function properly. The thyroid gland is functioning in animals before birth, and if the pregnant animal is suffering from iodine deficiency the young will be similarly affected.

Little pigs, as a result of iodine deficiency, are born without hair, have a puffy skin and usually are thick around the neck. They are often dead at birth, or die within a day or two.

The disease is easily prevented by supplying iodine in sufficient amounts to the pregnant sow. It is usually provided in the form of Potassium Iodide. A simple and efficient way to accomplish this is to dissolve one ounce of Potassium Iodide in a gallon of water and give one tablespoonful of this solution daily in the feed. A solution may be made with seven ounces of Potassium Iodide in a gallon of water, and give a tablespoonful once a week to the sow. The solution must be kept in a glass or enamelware container.

Anaemia of Suckling Pigs

Anaemia of suckling pigs occurs as a result of a deficiency of iron. Iron constitutes an important part of the blood and without it the blood is unable to carry out its proper function of supplying the body with food and oxygen. Anaemia of little pigs is the cause of substantial losses annually.

The iron necessary for life is present in the soil, and animals that are on pasture usually receive sufficient amounts. Before birth the little pigs receive all that they require from the blood of the mother. Sow's milk contains no iron, and from birth until they begin to eat regularly they have no source of available iron. This is most

marked in winter litters which do not have access to pasture or soil and in litters raised in floored pens, particularly of concrete. Thus at the most important stage of life and development conditions occur which may cause death or weakness which will render them more susceptible to other diseases.

The anaemia is usually apparent within a week of birth. In white breeds the skin is noticeably pale, the hair is dull and lacks lustre and sheen. Diarrhoea or scours may develop. They may show listlessness and not the playful energy we find in healthy litters. The ears, which are normally pink, become white. These pigs may die or become infected with disease germs unless treated.

Anaemia is preventable by supplying available iron to little pigs for that period from birth until they begin to eat. There are several methods by which this may be accomplished:

Fresh sods may be dug and placed in the pens twice a week. The little pigs will root in this and obtain sufficient iron. These sods may be fortified by sprinkling with a solution of iron sulphate, made by dissolving one ounce of iron sulphate in a quart of water.

Iron may be supplied to the pigs individually in the form of "reduced iron". The dose is estimated at being an amount which would cover half a ten cent piece. They should be given the first dose when they are three days old, and the dose repeated at weekly intervals for three weeks or until they are eating regularly. The reduced iron is placed well back in the pig's mouth. Do not throw it in as some may go down into the lungs.

Commercial preparations are available in which iron is incorporated with copper and sold in pill form. They are used in a similar manner to reduced iron.

Scours or Diarrhoea of Suckling Pigs

The cause of scours in suckling pigs is not fully understood, but it is believed to be the result of a vitamin deficiency, making the little pigs more susceptible to disease, and as such can be traced back to improper care and feeding of the pregnant sow.

Scours in little pigs is a serious condition. They shrink rapidly and die, or remain unthrifty for life.

To control the disease reduce the sow's feed immediately. For a day it is advisable to feed only a little shorts or feed flour mixed with equal parts of lime water and skim milk. Gradually bring her back to a full ration, to which is added one ounce of cod liver or feeding oil and three tablespoonfuls of dried brewers' yeast daily.

The little pigs may be given a teaspoonful of brewers' yeast moistened with a little milk once a day.

Don't neglect to clean and disinfect the pen.

Rickets, Stiffness, Crippling

The weaning period is a critical one for little pigs. They are changing from the natural sow's milk, rich in the vital minerals and vitamins, particularly calcium and phosphorus, and vitamins A and D, to artificial feed mixtures.

Weanling pigs that are on a diet lacking in these vitamins and minerals will become listless, bunch up and show reluctance to move about. There may be evidence of fits or convulsions, followed by stiffness of the joints and crippling in advanced cases. This is usually noticed about a month after weaning. The condition is purely nutritional in origin. Provided with proper care and feeding, pigs should never be affected with this condition. Follow recognized rations and feeding practices as outlined in previous sections of this Bulletin. And remember, too, that while a deficiency of calcium and phosphorus or vitamins at this time might not be great enough to produce marked symptoms, it may be sufficient to lower the resistance to other diseases, with results equally as disastrous.

Infectious Enteritis of Swine (Diarrhoea)

Swine are subject to several types of infectious enteritis. All are very serious, and can result in heavy loss. Unfortunately, medicinal treatment of infected animals has been disappointing, and the wise producer will do well to prevent its occurrence.

It has been shown that animals receiving an inadequate supply of vitamins are more liable to become affected with swine enteritis. We know, too, that the disease most often is found associated with unsanitary conditions. The use of the same ground for raisings pigs year after year results in the soil becoming heavily contaminated with the germs of infection, and the growing pigs are continually exposed to them. The presence of parasitic worms in the intestinal tract also helps to set up conditions favourable for an outbreak of enteritis.

Diarrhoea is a marked symptom from the start. This may or may not be blood tinged, and the affected animals soon show weakness and shrink rapidly. Some may die in three or four days, or are left stunted and unthrifty for life.

Control

1. Procure the services of a qualified Veterinarian if possible.
2. Separate the affected animals from the healthy ones.
3. Move the animals on to clean ground. Failure to do this makes the control of the disease practically impossible.
4. Clean and disinfect pens that have been occupied by infected animals.

There are several treatments recommended for enteritis:

1. Animals may be given a laxative of raw linseed oil. The animals are fasted overnight and the oil is put in feed troughs. The amount may be estimated at two cupfuls of oil per 100 lbs. of live weight. A good grade feeding oil and two tablespoonfuls of Brewers' Yeast per pig per day for a week or ten days may be fed, and the ration gradually brought back to a full fattening one.

2. Following the laxative, treatment with lye is recommended by some: Dissolve ½ lb. of lye in 25 gallons of water, and four bushels of oats are soaked in it for 12 hours. Feed nothing but these oats for 7-10 days.

3. Salt Treatment.—One to three pounds of salt is dissolved in five gallons of water and one bushel of oats is soaked in this solution. The animals are fed all the treated oats that they will eat. It is important that there is an ample supply of drinking water to prevent the toxic effects of the salt. The salt treatment is given for three days, omitted three days, and repeated again for three days.

4. Immunization.—On premises where the disease re-occurs, young animals may be vaccinated with an Enteritis Bacterin with some success. However, improved sanitation and clean ground are more important than the use of bacterins.

Pneumonia

Swine are commonly affected with diseases of the respiratory tract and pneumonia. These diseases are more prevalent in the colder seasons of the year, and among animals kept in dark, damp, draughty, poorly ventilated pens and stables. We find it occurring in animals following shipping, after exposure to cold wet chilling weather, and under all conditions which tend to lower the resistance of the animal. Some pneumonias are infectious and will spread from animal to animal, and from farm to farm. Haemorrhagic Septicaemia and Swine Influenza are specific instances, and any respiratory disease occurring in pigs should be regarded with suspicion. Care should be exercised in bringing new animals into the yard, since animals may be coming from infected premises or through infected stockyards.

Pneumonia is quite evident when it occurs. The pigs carry a fever, lose their appetite, are noticeably sick, breathe heavily, which may or may not be accompanied with a cough. Sometimes there is diarrhoea.

Control

1. If possible, procure the services of a Veterinarian.
2. Segregate the sick from the well.

In treatment of all respiratory infections hygiene is most important. Provide the animals with clean dry quarters protected from draughts but well ventilated, and clean fresh water to drink. A laxative of Epsom salts, administered early in the outbreak, is sometimes beneficial. The dose would be a tablespoonful dissolved in a cupful of water. A light easily digested diet is indicated.

The use of Haemorrhagic Septicaemia Bacterin is sometimes effective. On premises where the disease would appear to be of annual recurrence immunization of young pigs with a mixed Haemorrhagic Septicaemia Bacterin is recommended.

Internal Parasites of Swine

Swine suffer from both the lung worm and intestinal round worm. The common intestinal round worm is the one most prevalent in Alberta, and is the cause of substantial annual loss. The adult worm living in the intestinal tract causes irritation and damage to the intestinal wall, resulting in enteritis and unthriftiness. They also render the animal more susceptible to diarrhoeic infections by the damage done to the mucous membranes of the intestinal wall. The immature worms migrate through the lungs, and may cause extensive damage, resulting in pneumonia or a cough in young pigs. The worms then mature in the intestines.

Well fed, healthy swine sometimes carry worm infestation without showing any marked disturbance, a fact which again points to the advisability of proper feeding and management in disease prevention. However, parasites should not be tolerated. If they are not producing visible symptoms they are a constant threat and predispose the animal to other disease conditions.

Control

For control to be logical it is necessary to know something of the life history of the parasite. The adults in the intestine lay numerous eggs which pass out with the manure, contaminating the soil, feed utensils and pastures. These eggs or ova are swallowed by animals with their feed and hatch into larval worms which, before becoming established as adult worms in the intestine, migrate through the lungs and liver, causing extensive damage.

Prevention and Treatment

A study of the life history of the worm makes it easily understandable why sanitation is so necessary in the control of this parasite. Treatment alone, while it may destroy and remove most of the adult worms in the intestines, will not control the parasite.

One or two months before farrowing the sow should be treated for worms. The farrowing pen is cleansed and disinfected to remove

all worms and larvae. A good disinfectant is made by dissolving one pound of lye in 30 gallons of boiling water. This is used while it is still hot. After farrowing, the sow and litter are moved on to clean ground, and every effort is made to keep the pigs from becoming exposed to ground and pasture contaminated with worm eggs from the manure of infected hogs.

Treatment

There are several methods of treatment.

1. **Sodium Fluoride.**—Weigh the amount of grain or chop that is fed to the pigs in one day. To this is added one percent by weight of Sodium Fluoride. Care should be taken to mix it thoroughly, and it must be fed dry. Pigs may be given water to drink between meals. Care must be taken in measuring the sodium fluoride for it is toxic, and poisoning may occur. One quarter pound of sodium fluoride to 25 lbs. of dry feed will make a one percent by weight mixture.

2. **Phenothiazine.**—One regular feeding should be omitted prior to the dosing with this drug. The pigs are then penned in groups of four or five with the animals in each group as near to equal weights as possible. The phenothiazine is mixed with a grain slop at the rate of one-half tablespoonful per 100 pounds of pig. The animals should not be allowed out in bright sunlight for several days after dosing.

3. **Oil of Chenopodium.**—This drug requires individual dosing. Two regular feedings are omitted and oil of chenopodium is administered at the rate of one teaspoonful per 100 lbs. of pig. This dose may be increased or decreased depending upon the size of the animal.

External Parasites—Mange and Lice

Mange is a contagious skin disease of swine, and is most prevalent in the colder seasons of the year, and is more often observed in pigs kept in unsanitary surroundings. The lesions first appear as redness and irritation of the skin about the nose, eyes and ears. The infection soon spreads along the neck, over the back and on the side of the animal. As it progresses the skin becomes coarse, wrinkled and thickened. Treatment consists of applying oil or oil and sulphur mixtures which will destroy the parasites causing the disease. It should be repeated at weekly intervals for a month or more. The pens must be as thoroughly cleansed and disinfected as possible. The hot lye solution is effective.

A suitable preparation for treatment of 50 hogs is:

2 lbs. of sulphur,
8 ounces oil of tar,
1 gallon raw linseed oil.

This is well mixed and applied warm with a stiff brush.

Lice are quite large and are usually quite evident when an animal is infested. They are blood suckers and cause a great deal of discomfort to the animal.

They are easily controlled by the application of oil on the skin with a brush. Raw linseed oil or used crankcase oil is effective.

Paralysis of the Hind Quarters

Paralysis of the hind quarters occurs occasionally in swine; most often in brood sows at any time during pregnancy up until the litter has been weaned.

The cause is thought to be a lack of calcium, phosphorus and essential vitamins.

The condition is gradual in its onset, and is first marked by an apparent weakness of the hind quarters, which becomes more marked until it assumes a true paralysis. The animal keeps its appetite and remains bright.

Sows so affected may sometimes be brought back to their feet with the use of calcium preparations, but this requires the services of a Veterinarian.

The sow, when down, should be given a laxative diet with an ample supply of green feeds. In winter time a good grade of feeding oil should be supplied. Lime water is beneficial in that it supplies calcium. Ground limestone or bonemeal are also good sources of calcium, and are very easily mixed into the feed.

Prevention is much more certain than the cure. The pregnant sow must receive a good nutritious ration, rich in the essential minerals, calcium and phosphorus. In winter months when fresh green feed is not available, supply the vitamins A and D with a good quality feeding oil. Exercise of the pregnant animal is another factor which must not be neglected, even in the cold winter months.

Failure of the Sow to Milk

On occasions the little pigs are born but the sow fails to supply milk for them. The cause probably has its origin in improper feeding of the pregnant animal. The condition can usually be corrected by the use of calcium preparations and special hormones administered by a Veterinarian. The owner can help by administering a laxative of raw linseed oil and putting the sow on a sloppy laxative diet for a day.

Rhinitis or Bull Nose

This condition is found most often in pigs kept in unsanitary and filthy surroundings. The infection is in the air passages of the nose

and progresses to the stage where there is a marked deformity. The snout becomes thickened, wrinkled and turned upwards. It is caused by a specific disease germ. Treatment is useless. A general cleansing and disinfection of the premises is indicated. Dry feeding will cause sneezing and irritation. Hogs affected with rhinitis can be marketed satisfactorily by mixing the chop with water or milk.

Swine Erysipelas—Arthritis

This is a serious infectious disease of swine, and is present in some districts of the Province. It appears in two forms. In one instance the affected animal will develop diamond-shaped, red, swollen areas along the back and sides. The skin in these areas eventually dies and sloughs off. This disease is called Diamond Skin Disease. The second form is evidenced by arthritis. The affected animals develop swollen joints, lameness and general unthriftiness. Should the disease occur, obtain the services of a qualified Veterinarian as soon as possible.

Veterinary Services

It is strongly recommended to all swine producers to obtain the advice and services of a Veterinarian when sickness appears in their hogs. This is impossible in some districts of Alberta, but where such services are available it is in the producer's own interest to have professional advice.

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